# PLANT BREEDING ABSTRACTS

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# PLANT BREEDING ABSTRACTS

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# TABLE OF CONTENTS


| | PAGE |
|---|---|
| Statistics | 1 |
| Genetics | 5 |
| Evolution | 18 |
| Cytology | 19 |
| Crop plants | 26 |
| Cereals | 51 |
| Wheat | 53 |
| Buckwheat | 62 |
| Oats | 62 |
| Rye | 63 |
| Maize | 65 |
| Barley | 69 |
| Millets and sorghums | 72 |
| Rice | 73 |
| Forage grasses (including general studies of forage crops) | 77 |
| Leguminous forage plants | 82 |
| Roots and tubers | |
| Beet | 87 |
| Turnip | 87 |
| Potato | 87 |
| Sweet potato | 93 |
| Fibres | |
| Cotton | 93 |
| Flax | 96 |
| Hemp | 97 |
| Kenaf | 97 |
| *Edgeworthia* | 98 |
| Sugar and starch plants | |
| Sugar cane | 98 |
| Sweet sorghum | 99 |
| Sugar beet | 99 |
| Cassava | 102 |
| *Dioscorea* | 103 |
| Stimulants | |
| Tobacco | 103 |
| Tea | 104 |
| Coffee | 104 |
| Cacao | 106 |
| Poppy | 106 |
| Minor crop plants (*Chenopodium*, lavender, *Pelargonium*, *Capsicum*, rape, castor oil plant, sesame, linseed, tung, sunflower, *Acacia*, medicinal plants, *Plantago*, rubber plants) | 106 |
| Fruit and nuts (including general horticultural reports) | 111 |
| Pome fruits | 116 |
| Stone fruits | 117 |
| Citrus fruits | 120 |
| Fig | 121 |
| Mulberry | 121 |
| Mango | 121 |
| Walnut | 121 |
| Groundnut | 121 |
| Coconut | 123 |
| Olive | 123 |
| *Emblica* | 123 |
| *Carica* | 123 |
| Avocado | 124 |
| Small fruits | 124 |
| Grape | 126 |
| Forest trees | 128 |
| Vegetables | 136 |
| Carrot | 137 |
| Radish | 137 |
| Jerusalem artichoke | 137 |
| *Allium* | 138 |
| Asparagus | 139 |
| *Brassica* | 139 |
| Spinach | 140 |
| Lettuce | 141 |
| Cucurbits | 141 |
| Tomato | 143 |
| *Vicia* | 146 |
| *Phaseolus* | 146 |
| *Vigna* | 148 |
| Soya bean | 148 |
| *Pisum* | 149 |
| *Cicer* | 151 |
| Sweet corn | 151 |
| Mint | 151 |
| Economic lower plants (*Acetobacter*, *Streptomyces*, *Claviceps*, yeasts) | 151 |
| Book reviews | 155 |
| Index | 166 |


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# Plant Breeding Abstracts

## Vol. XXIX, No. 1

### STATISTICS

1 LINDLEY, D. V.
**Binomial sampling schemes and the concept of information.**
Biometrika 1957 : **44** : 179–86.

Methods are described for sampling sequentially from a binomial population until enough information about the proportion has been obtained. The methods use prior probabilities.

2 CLIFFORD COHEN, A. (JUN.).
**On the solution of estimating equations for truncated and censored samples from normal populations.**
Biometrika 1957 : **44** : 225–36.

Charts are provided to simplify the problem of the title.

3 FAIRFIELD SMITH, H.
**A multivariate analysis of covariance.**
Biometrics 1958 : **14** : 107–27.

A detailed analysis is made of an experiment on the effect of drugs on denervated muscles which would ordinarily be treated by analysis of covariance methods but where the concomitant variable was unexpectedly affected by the treatments. The emphasis is primarily on the mode of analysis. The importance of the difference between regression and structural analysis is stressed.

4 STUART, A.
**Iterative solutions of likelihood equations.**
Biometrics 1958 : **14** : 128–30.

It is pointed out that Fisher's original method is better than Norton's [XXVII, 980]* in the numerical example quoted by the latter, and that not so many iterations may be needed as Norton suggested.

5 HARTLEY, H. O.
**Maximum likelihood estimation from incomplete data.**
Biometrics 1958 : **14** : 174–94.

A method of carrying out numerical maximum likelihood estimation is described, which is suitable when part of the range of the observed variable is incompletely observed. The method is described and illustrated for discrete distributions and is particularly suitable when maximum likelihood for the complete sample is straightforward. Truncation and censoring are both considered. It is shown how the estimates of variances and covariances may be obtained.

6 CORSTEN, L. C. A.
**Partition of experimental vectors connected with multinomial distributions.**
Biometrics 1957 : **13** : 451–84.

In the usual 2 x 2 contingency table it was first pointed out by Fisher that the contribution to $\chi^2$ could be split into three components representing row effects, column effects and interactions respectively. The present paper discusses this partition in detail and extends the analysis to $2^3$ tables, using a vector language invented for the purpose. There is a discussion of previous work. The theory is illustrated throughout by genetical examples.

7 BULMER, M. G.
**Approximate confidence limits for components of variance.**
Biometrika 1957 : **44** : 159–67.

A problem of practical importance in genetic and other studies involving components of variance is provided with a simple approximate solution, i.e., if $M_1$ and $M_2$ are independent mean squares with unknown expected values $\theta + \sigma^2$ and $\sigma^2$ respectively, how can confidence limits for $\theta$ be found? Comparisons with other methods are included.

8 PEARCE, S. C.
**Experimenting with organisms as blocks.**
Biometrika 1957 : **44** : 141–49.

Suppose that when a treatment is applied to a plot it affects not merely the observation on that plot but also the observations on other plots within the same block. These are called "local" and "remote" effects respectively. The author describes balanced incomplete block designs in which it is possible to investigate the effects separately and to test for an interaction between them. The analysis is described and illustrated on xenia effects in apples where the "blocks" are individual trees and the "plots" are groups of blossoms.

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* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

9 Michelson, I. F., Lachman, W. H. & Allen, D. D.
**The use of the "weighted-rankit" method in variety trials.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 334–38.

The procedure is as follows. The characters used in evaluation are assigned a percentage value (weight), the total for all characters being 100%. In the trials, the varieties being tested are ranked in order of superiority for each character. The rank values are then converted into rankits, multiplied by the weight, and the rankit x weight values for each character summed. The totals are then subjected to analysis of variance.

10 Cochran, W. G.
**Analysis of covariance. Its nature and uses.**
Biometrics 1957 : **13** : 261–81.

The principal practical uses of the analysis of covariance are described and the dangers in uncritical use of the technique mentioned. There then follow sections on (i) the computations, (ii) the nature of the covariance adjustment, (iii) the theory and (iv) the role of the assumptions. Extensions to multiple covariance and to complex classifications are outlined.

11 Fairfield Smith, H.
**Interpretation of adjusted treatment means and regressions in analysis of covariance.**
Biometrics 1957 : **13** : 282–308.

The simplest analysis of covariance, into treatment and error, is discussed in detail. The paper is primarily concerned with necessary properties that the independent variable in the regression model should have, and with what happens when these properties do not hold. The principal property discussed is the requirement that the independent (or concomitant) variable is unaffected by treatments, either by direct causation or through correlation with another affected character. Several agricultural examples are considered.

12 Zelen, M.
**The analysis of covariance for incomplete block designs.**
Biometrics 1957 : **13** : 309–32.

The paper contains introductory remarks on the use of covariance analysis and five other sections: (1) the general procedure for intra-block analysis of covariance for $p$ concomitant variables; (2) recovery of interblock information; (3) formulae for direct application to balanced and partially balanced (two associate classes) incomplete block designs; (4) allowance for regression differing between blocks; and (5) an example with one concomitant variable in which a general regression model is used to relate a dependent variable to both qualitative and quantitative variables.

13 Federer, W. T.
**Variance and covariance analyses for unbalanced classifications.**
Biometrics 1957 : **13** : 333–62.

The algebraic details are given for two-way and three-way classifications in three cases: (*a*) no interaction; (*b*) interaction with fixed effects; and (*c*) interaction and some random effects. A horticultural example for a two-way classification with case (*a*) is given.

14 Wilkinson, G. N.
**The analysis of covariance with incomplete data.**
Biometrics 1957 : **13** : 363–72.

A procedure for the insertion of missing values is described and illustrated by an example. The effects of the insertion on standard errors and significance tests are examined.

15 Finney, D. J.
**Stratification, balance and covariance.**
Biometrics 1957 : **13** : 373–86.

Suppose that $t$ treatments are to be compared by an experiment on $N$ organisms, $r$ being assigned to each treatment ($N = rt$). A pre-treatment variable $x$ is available for each organism. Four designs are considered: (1) completely randomized; (2) randomized blocks with $x$ values are nearly constant as possible within blocks; (3) as (1) but with restricted randomization so that the mean values of $x$ for the several treatments are approximately equal; and (4) as (2) but with the same restricted randomization as (3). The expected variances of treatment means for the four designs are compared; the need for covariance adjustments is emphasized; design (2) is generally recommended. [Cf. 20].

16 Coons, I.
**The analysis of covariance as a missing plot technique.**
Biometrics 1957 : **13** : 387–405.

Bartlett's original technique for dealing with missing plots by introducing dummy variables and performing covariance techniques is explained and illustrated by the following examples: (i) fractionally replicated design of a $2^5$ x 4 factorial; (ii) split-plot design (both these with one missing plot); and (iii) split-plot

design with two missing subplots from different whole plots.

17 Bradley, R. A. & Schumann, D. E.
**The comparison of the sensitivities of similar experiments : applications.**
Biometrics 1957 : **13** : 496–510.

Suppose two similar experiments have been performed to investigate the same treatment differences. The authors describe how to test the hypothesis that the overall treatment differences are more marked in one experiment than the other, the overall difference being supposed measured by a single parameter, which is roughly the mean square error of the treatment means. Numerical examples on discriminating abilities of judges and yields of pasture under irrigation, are included. The method also applies to the testing of equality of multiple correlation coefficients. A chemical engineering problem provides an example of this application.

18 Hatheway, W. H. & Williams, E. J.
**Efficient estimation of the relationship between plot size and the variability of crop yields.**
Biometrics 1958 : **14** : 207–22.

Fairfield Smith has suggested that the logarithm of the variances between plots of a given size is linearly related to the logarithm of the size of the plot. The authors describe an efficient method of estimating the constants in the relationship. An allowance for departure from this relationship in determining optimum plot size is discussed.

19 Wilkinson, G. N.
**Estimation of missing values for the analysis of incomplete data.**
Biometrics 1958 : **14** : 257–86.

A general procedure is described for the insertion of a few missing observations in a planned experimental design. The general least-squares theory is given, together with a method for setting up the missing value equations and their solution by matrix inversion. Detailed tables are provided to simplify the analysis for standard designs such as balanced incomplete blocks and Latin squares.

20 Cox, D. R.
**The use of a concomitant variable in selecting an experimental design.**
Biometrika 1957 : **44** : 150–58.

The problem is the same as that considered by Finney [cf. 15]. Seven methods are described: (1) an index of response, for example $y/x$; (2) complete randomization with a covariance adjustment; (3) randomized blocks based on the values of $x$; (4) Latin square design controlling $x$-variation within blocks as well as between them; (5) method (3) with covariance adjustment; (6) randomized blocks chosen according to another consideration, plus covariance adjustment for $x$; and (7) systematic designs. It is assumed that, in the absence of treatment effects, $y$ and $x$ have a bivariate normal distribution. An index of precision of the designs is based on the average variances of treatment differences. Two conclusions are that (1) the methods based on covariance are preferable to blocking methods only if the correlation between $y$ and $x$ exceeds 0·6, and that (2), under certain conditions, systematic designs are best.

21 Sillitto, G. P.
**An extension property of a class of balanced incomplete block designs.**
Biometrika 1957 : **44** : 278–79.

A simple method of producing some designs of this type is described.

22 Curnow, R. N.
**Heterogeneous error variances in split-plot experiments.**
Biometrika 1957 : **44** : 378–83.

In a split-plot experiment in which the whole plots are split into two, it is shown how a test of significance may be found for investigating the equality of the error variances on the two plots. In the example the whole plots of cocksfoot were split for high and low levels of fertilizers, the higher yields on the former suggesting a higher variance. Confidence intervals for the ratio of variances and standard errors for the treatment means are described.

23 Geidel, H.
Zur Variabilität der Einzelpflanze. (**On the variability of the individual plant**).
Z. Acker- u. PflBau. 1958 : **106** : 49–57.

Notes are provided on the statistical determination of the variability of individual plants; with this information, it is possible to decide how large the plots in a field experiment should be in order to prevent individual variability from affecting the results.

24 Geidel, H.
Zur Genauigkeit von Versuchsergebnissen. (**The accuracy of experimental results**).
Z. Pflanzenz. 1958 : **39** : 438–46.

With reference to some many-year trials of potato varieties carried out in Federal Germany, it is shown how statistical methods may be used to achieve an accurate picture of varietal

differences when all the experimental data available are considered.

25 SCHULZE, J.
Zur Bestimmung der Einzelfehler in Spaltanlagen. (**The determination of the individual errors in split layouts**).
Z. Pflanzenz. 1958 : **40** : 37–58.

It is pointed out that only when the treatment errors are homogeneous may the average error be used successfully in procedures such as the $t$ and $F$ tests. By means of examples, it is shown how the individual errors of main and subplot treatments and of the reciprocal effects between these treatments may be determined in split-plot experiments, where the main plots are arranged in blocks or Latin squares. The difference method is used. [Cf. XXV, 23].

26 SPECHT, G.
Zu einigen Problemen bei der Verrechnung und Auswertung von Feldversuchen. (**Some problems in the calculation and analysis of field trials**).
Z. landw. Vers.- UntersuchWes. 1957 : **2** : 107–16.

The activities of the working party for studying methods of trial procedure of section 10 of the Berlin Academy of Agricultural Sciences are surveyed, reference being made to recent publications concerning this work [cf. XXVI, 2972 and XXIX, 27–28]. Symbols used by the working party in their statistical studies are listed and formulae used for the standard error of the average of treatment means are discussed. [Cf. XXIV, 4.]

27 MÜLLER, K.-H.
Die Anlage und Auswertung faktorieller Feldversuche. (**The layout and analysis of factorial field trials**).
Z. landw. Vers.- UntersuchWes. 1957 : **2** : 117–35.

Yield is influenced by a number of factors, including the variety and the cultural measures used. With reference to randomized-block and split plot designs it is shown how the combination of factors giving the highest yield may be found.

28 ORTLEPP, H.
Überlegungen und Vorschläge zur Anordnung der Teilstücke in Feldversuchsanlagen. (**Reflections and proposals concerning the arrangements of plots in field-trial layouts**).
Z. landw. Vers.- UntersuchWes. 1957 : **2** : 136–50.

In order to find a way of compensating for soil differences, uniformity trials were carried out with various systematic and other plot arrangements in Latin square and block layouts. A controlled fair distribution based on Behrens' criteria [cf. XXVII, 15] gave the best results for it resulted in a marked reduction of the treatment variance; this distribution of plots is considered to be an improvement on the usual schemes with a chance distribution. A knight's move arrangement of the plots also gave good results and a diagonal arrangement was unsatisfactory.

29 BAHN, E., BANNEICK, A., MÖBIUS, H., MÜLLER, K. H. & ORTLEPP, H.
Anlageschemata für Feldversuche (2–16 Prüfglieder) erarbeitet nach den Prinzipien einer gelenkten, gerechten Verteilung der Teilstücke. [**Layout schemes for field trials (2–16 treatments) worked out according to the principles of a controlled fair distribution of the plots**].
Z. landw. Vers.- UntersuchWes. 1957 : **3** : 151–205.

Schemes are described for some of the most usual layouts, these being randomized-block designs, Latin squares and rectangles and balanced lattices. The proposed arrangements make allowance for soil differences [cf. 28] and simplify the work involved in field trials.

30 EBERT, D. & SCHNEE, M.
Zum Problem der Erntetechnik im Feldversuchswesen. Einzelpflanzen- und Reihenernte. (**The problem of harvest technique in field experiments. Single plant and row harvesting**).
Z. landw. Vers.- UntersuchWes. 1957 : **3** : 245–67.

The aim of the experiments described was to find ways of reducing the labour and expense involved in harvesting during field trials. Harvesting single plants proved to be unsatisfactory in fodder beet trials on account of the increased calculation required in working out the results. In both beet and cereal trials it was found that, by harvesting a few rows from the centre of a plot, the results obtained were similar to those from a normal experiment. This method did not result in any saving of time as compared with the normal procedure but the harvesting technique was simplified.

31 Sváb, J.
Überlegungen zu methodischen Fragen der Grossflächenversuche. (**Consideration of questions of method of large scale trials**).
Z. landw. Vers.- UntersuchWes. 1957 : **3** : 268–78.

This is a German version of an article already summarized from another source [cf. XXVIII, 2611].

32 Dorst, J. C.
**Use of variation of replications in breeding work.**
Euphytica, Wageningen 1958 : **7** : 111–18.

An English version is given of a lecture delivered in 1946 at a joint meeting of the Study Circles for Plant Breeding and Experimental Design in the Netherlands [cf. XVIII, 737].

33 Govinda Iyer, T. A.
**Replications in field experiments.**
Madras agric. J. 1958 : **45** : 223–30.

The number of replications ($n$) required to guarantee that a predetermined percentage difference between treatment means ($D$) is statistically significant is given by

$$n = \left(\frac{t \times \sqrt{2} \times CV}{D}\right)^2,$$

where $CV$ is the coefficient of variation worked out from previous experiments of the same type, and $t$ is the appropriate reading from the $t$ tables for the number of degrees of freedom involved in estimating $CV$. A procedure to adjust the mean $CV$ for variations in the general mean is also suggested. The method is exemplified with reference to rice varietal trial data at Coimbatore.

34 Mazumdar, S.
**Use of confounded designs and fractional replications in testing variety x fertilizer interactions.**
FAO UN, Rome (undated) : No. FAO/58/1/71 : Pp. 9. (Mimeographed).

The following layouts are exemplified for the benefit of rice investigators: $2^5$ factorial confounded in blocks of 8; $2^6$ factorial confounded in blocks of 16; $2^6$ factorial confounded in an 8 x 8 quasi-Latin square, $\frac{1}{2}$ replication of $2^7$ factorial confounded in blocks of 8; $\frac{1}{4}$ replication of $2^8$ factorial confounded in blocks of 16; split-plot confounding for irrigation experiments; and 4 x $2^3$ factorial confounded in blocks of 8.

35 Scossiroli, R. E. & Scarascia, G. T.
Applicazione della statistica in agricoltura. III Nota. (**Application of statistics in agriculture. Note III**).
Tabacco, Roma 1957 : **61** : 419–29.

Analysis of variance is explained and exemplified with reference to a tobacco variety trial [cf. XXVIII, 3612–3].

36 Darby, L. A. & Gilbert, N.
**The Trojan square.**
Euphytica, Wageningen 1958 : **7** : 183–88.

An experimental design, based on orthogonal Latin squares and considered to be of particular value for variety trials in glasshouses, is described. Use of the term Trojan square is suggested when the number of Latin squares exceeds two. The design falls between the rigidity of a Latin square and the complexity of a lattice square. Its application is illustrated by a yield trial of cucumber varieties.

## GENETICS

**Abstracts of papers read at the hundred and twenty-sixth meeting of the Genetical Society of Great Britain, held on 2nd and 3rd April 1958, at the University of Reading.**
Heredity 1958 : **12** : 393–400.

37 *Dowrick, G. J. & Williams, W. Experiments on the induction of mutations in crop plants.* (*p. 393*).

An account is presented of experiments on the use of $P^{32}$ as a mutagen. The mutant phenotypes obtained were characterized by differences in growth rate as compared with both naturally-occurring identical mutants and the wild type. Evidence indicating that the variability of complex quantitative characters is increased in irradiated material is presented, selection for maximum character expression being then more effective.

38 *Whitehouse, R. N. H. The use of artificially induced mutations in crop improvement.* (*p. 393*).

Problems involved in the use of mutagenic agents for crop improvement are analysed. It is thought that mutation breeding is of limited value at present and that more fundamental work on the process of mutation is required.

39 *Roper, J. A. Cytoplasmically determined variation in* Aspergillus nidulans. (*pp. 393–94*).

Serial subculture in a medium containing acriflavine produced irreversible changes in strains of *A. nidulans* resistant to acriflavine. Three

of the modified strains bore no or few conidia; this "mycelial" condition was found to be cytoplasmically determined and transmitted by heterocaryosis to other genotypes with or without an allele for acriflavine resistance. The three mycelial strains were cytoplasmically different and each type of cytoplasm gave a range of phenotypes in combination with different genotypes.

Balanced heterocaryons between a mycelial and a nonmycelial type were almost normal. Some mycelial types were obtained from mitotic recombination in such diploids and both mycelial and normal types were given by meiotic recombination in crosses between the two types. Segregation of the mycelial condition at meiosis seemed to be irregular; the determination of the phenotype in mitotic recombination in heterozygous diploids appeared to be correlated with the particular genotype produced at crossing over or haploidization.

40 *Riley, R. Rye-wheat chromosome addition and substitution lines.* (*p. 396*).

Mention is made of how single pairs of rye chromosomes have been added to the full chromosome set of wheat by back crossing and selfing derivatives of wheat-rye hybrids and amphidiploids [cf. XXVII, 2775]. Lines with telocentric derivatives of rye chromosomes either as monosomic or disomic additions have been developed and from crosses of disomic addition lines with wheat monosomics, substitution lines were obtained in which a wheat chromosome pair was replaced by a rye pair. The rye chromosomes compensated for the absence of the wheat pair in the lines studied and the phenotype of the addition line was largely retained.

41 *Unrau, J. Cytogenetic studies with aneuploids in common wheat.* (*pp. 396–97*).

Reference is made to studies of nullisomics and monosomics in Chinese Spring and of the progeny of crosses between these lines and varieties with contrasting characters; it has been possible to identify the chromosomes carrying the genes for a number of morphological characters and leaf and stem rust reaction. "Changed character expression of $F_1$ in some instances, and $F_2$ + $F_3$ ratios modified by characteristic univalent chromosome transmission and breeding behaviour, revealed the critical chromosome(s)". Substitution lines have been used to study the genetic effects of different chromosomes on a number of important characters. [Cf. XXVII, 399 and XXVIII, 263 and 2821].

42 *Reissig, J. L. A suppressor of citrulline dependence in* Neurospora: *a case of single gene heterosis.* (*p. 397*).

A citrulline dependent strain, *cit*, of *N. crassa* was plated on media supplemented with lysine, canavanine and hydrolysed RNA; mutant colonies which were citrulline-independent but pyrimidine-dependent were found.

"Both *cit* and the pyrimidine requirement are closely linked to the colonial marker *co*, yet the two requirements are not allelic. Crossing *co* pyrimidine-dependent with *co*+ prototroph, most of the *co* pyrimidine-independent segregants are citrulline requirers. This suggests a map order: *co-cit-pyr* (*pyr* could be allelic to the previously known $pyr_3$), where *pyr* suppresses the *cit* phenotype. It is not possible at this stage to discriminate between suppression due to *pyr* taking over the synthesis of citrulline, or due to less direct metabolic interactions as have been suggested by Mitchell and Mitchell for other interrelations between pyrimidine and arginine mutants.

"The *cit* and the *cit, pyr* nuclei combine to make a heterokaryon able to grow on minimal medium. This is an example of over-dominance, since both nuclei differ by only one mutation."

43 *Elliott, G. Effects of temperature, and of selecting rare cross-overs, on recombination in* Aspergillus nidulans. (*p. 398*).

It has been found that, "when rare cross overs are selected recombination in a region on the same chromosome as, but not adjacent to, the selective markers may or may not be increased. The occurrence or otherwise of this increase depends on the positions where crossing over occurs in the chromosome, a distribution which varies with temperature (cf. *Drosophila*). There is no evidence of an effect of this kind when recombination is measured in different chromosomes from that carrying the selective markers."

44 *Finney, D. J. Statistical problems in the selection of crop varieties.* (*p. 399*).

In selecting a new variety from a number of potential ones, a series of field trials has to be carried out. Statistical theory has been used to decide the optimum number of varieties from which to start the selection, the optimum number of stages in the selection procedure, the optimum intensities of selection in the different stages and similar problems. Simple rules to apply to these questions are suggested; also the relation of the selection programme to the whole agricultural economy is considered and it is tentatively suggested that a small number of stages and a rapid testing and output of new varieties

may be often preferable to more thorough and slower testing.

45 *Cooper, J. P. The genetic structure of ryegrass strains and its implications for herbage plant breeding.* (*p. 400*).

A survey was made of the amount of potential variation within two populations, Irish and Kent, of perennial ryegrass. Date of ear emergence was studied and early and late selection lines were established, using different initial population sizes and different intensities of inbreeding.

After three generations of selection, the means of some extreme lines were well outside the range of the original populations; the use of four plants as the basis of selection in each generation was sufficient to avoid inbreeding depression. It was concluded that considerable potential genetic variation may be carried within a small group of plants of similar phenotype and may be released within a few generations.

46 Pardee, A. B., Jacob, F. & Monod, J. Sur l'expression et la rôle des allèles "inductible" et "constitutif" dans la synthèse de la β-galactosidase chez les zygotes d'*Escherichia coli*. (**On the expression and role of "inducible" and "constitutive" alleles in the synthesis of β-galactosidase in *E. coli* zygotes**).
CR Acad. Sci., Paris 1958 : **246** : 3125–28.

The synthesis of β-galactosidase in *E. coli* depends on (*a*) the factor *i*, of which the two alleles $i^+$ and $i^-$ respectively determine the inducible state and the constitutive state; and (*b*) the closely linked alleles $z^+$ controlling capacity to synthesize the enzyme and $z^-$ governing incapacity to do so. In a medium lacking an inducer neither $z^-i^-$ nor $z^+i^+$ genotypes are able to synthesize the enzyme. On crossing, synthesis is rapidly effected by the combination $z^+z^+$ ♂ x $z^-i^-$ ♀ but not at all by the reciprocal. The gene $z^+$ is thus expressed immediately on reaching $z^-i^-$ cytoplasm. The gene $i^-$ however is not expressed on introduction into inducible cytoplasm, suggesting that the gene for inducibility is dominant; this is confirmed by the observation that the addition of an inducer to the zygotes $z^+i^+$ ♂/$z^-i^-$ ♀ results in an increase in enzyme production. It is suggested that the allele $i^+$ governs the production of a repressor which blocks the synthesis of β-galactosidase and which may be displaced by the action of exogenous inducers.

47 Pateman, J. A. & Fincham, J. R. S. **Gene-enzyme relationships at the *am* locus in *Neurospora crassa*.**
Heredity 1958 : **12** : 317–32.

From some crosses between *am* mutants for production of glutamic dehydrogenase only true wild types with a very low frequency were obtained, while from other crosses only pseudowilds with a comparatively high frequency were recovered. The true wild types grew normally on a minimum medium and were fully comparable to stock wild types in glutamic-dehydrogenase activity. The frequencies of the true wild type derived from the various intercrosses could not be adequately explained in terms of crossing over within a linear arrangement of sites; it is suggested that at least some of the true wilds may have arisen through gene conversion. The pseudowilds were intermediate in growth on a minimum medium between *am* and stock wild-type strains and they possessed low glutamic-dehydrogenase activity. Heterocaryons were reconstituted from *am* strains, with no detectable glutamic-dehydrogenase activity, which had been isolated from pseudowilds. These heterocaryons were similar to the pseudowilds in having low enzyme activity. Thus certain *am* heteroalleles, which individually in homocaryons are incapable of producing detectable glutamic-dehydrogenase activity, are complementary in function when present in different nuclei in a heterocaryon. Heterocaryons were synthesized between various *am* mutants in all possible combinations. Pairs of heteroalleles which had resulted in pseudowilds in sexual crosses produced glutamic dehydrogenase in heterocaryons. Pairs of heteroalleles which had given no pseudowilds in sexual crosses formed no enzyme in heterocaryons. Homocaryotic $am^1$ strains contain a qualitatively different glutamic dehydrogenase from the wild type, but $am^1$ is complementary to certain other *am* heteroalleles, as shown by the behaviour of heterocaryons, which produce greater or smaller amounts of apparently normal glutamic dehydrogenase in addition to the $am^1$ type of enzyme [cf. XXVIII, 3651].

48 Wollman, E. L. & Jacob, F. Sur le déterminisme génétique des types sexuels chez *Escherichia coli* K12. (**On the genetical determination of sexual types in *E. coli* K12.**)
CR Acad. Sci., Paris 1958 : **247** : 536–39.

While $F^+$ and $F^-$ cultures appear to have chromosomes in which the genes may be represented as lying on a closed curve [cf.

XXVII, 1130], the former type with and the latter without the sexual factor $F$, cultures of the Hfr type have a chromosome which is effectively or potentially rectilinear, with the sexual determinant attached to the distal end. Thus when an Hfr strain with the proximal factors $A^+B^+$ and the distal factors $Y^-Z^-$ conjugates with an $F^-$ strain, a high proportion of recombinants will receive only the proximal characters and will be $F^-$, while the Hfr character will occur only in the few in which the distal character $Z^+$ is present; recombinants with $Z^-$ are not Hfr. Most recombinants receiving $Z^+$ also carry $A^+$ and these are nearly all Hfr while many of those with $A^-Z^+$ are not. When $A^-Z^+$ Hfr types are crossed with $F^-$, recombinants are formed at a frequency 100–1000 times lower than the original Hfr type. When the recombinants $A^-B^-$ . . . $Y^+Z^+$ are back crossed to the parental Hfr, most of the $A^+B^+$ . . . $Y^+Z^+$ recombinants formed are of the same type as the original Hfr.
The sexual factor is regarded as an example of an episome [cf. 62]. The possible existence of additional sexual types, such as forms with the sexual factor localized at a definite point in the circular chromosome or forms with a rectilinear chromosome lacking a sexual factor, is postulated.

49 **Symbolism in heterothallic fungi.**
Mycologia 1958 : **50** : 444–46.
It is proposed that the symbols + and — be retained to designate isolates, not genes, of different mating type; in work on the genetics of mating type, the genes involved may then be designated by any desired letters.

50 Žukovskij, P. M.
**[The creative path of Nikolaj Ivanovič Vavilov. (The 70th anniversary of his birth)].**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 905–11. [Russian].
A vivid personal account is given of the life and work of N. I. Vavilov, with an appreciation of his services to the science of crop plants and to Soviet agriculture. Some modifications in the principles established by Vavilov have been necessary, the greater relative importance of secondary centres of diversity having been recognized; but in general his views on plant distribution, homologous series, genetic immunity, and the importance of amphidiploidy and of heterosis have, it is claimed, been substantiated. It is pointed out that of the ten maize hybrids approved in the Soviet Union nine emanate from the Institute of Plant Industry.

51 Bachteev, F. C. [Bahteev, F. H.]
Nikolaj Ivanovič Vavilov (26.11.1887–2.8.1942), Zu seinem 70. Geburtstag.
**[Nikolaj Ivanovič Vavilov (26.11.1887–2.8.1942) on his 70th birthday.**
Züchter 1958 : **28** : 161–66.
A detailed account of the activities of Vavilov is presented, special mention being made of his work on the geographical centres of origin of cultivated plants.

52 Bahteev, F. H.
**(Academician Nikolaj Ivanovič Vavilov).**
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel. biol. (Biol. Ser.) 1958 : **63** : No. 3 : 155–65. [Russian]
This biographic survey was read at a meeting of the Genetics Section of the Moscow Society of Naturalists on 26 November 1957, on the occasion of the seventieth birthday anniversary of Vavilov.

53 Preston, W. H. (Jun.) & Link, C. B.
**Dwarfed progeny produced by plants treated with several quaternary ammonium compounds.**
Plant Physiol. 1958 : **33** : Suppl. p. xlix. (Abst.)
Application of the following compounds to stems of seedlings of the bean Black Valentine at the age of seven days resulted in dwarfed growth and, in addition, dwarfed progeny in the succeeding generation: (5-hydroxycarvacryl)-trimethylammonium chloride 1-piperidine-carboxylate (Amo–1618); (5-hydroxycarvacryl)trimethylammonium iodide 1-piperidine-carboxylate; (5-hydroxycarvacryl)trimethyl-ammonium iodide (2-chloroethyl)-ethyl-carbamate; (5-hydroxycarvacryl)trimethyl-ammonium iodide N,N-dimethylcarbamate; and (6-hydroxythymyl)trimethylammonium iodide 1-piperidine-carboxylate. Treatment of the flower peduncles with Amo–1618 one to two days prior to the opening of the first flowers also led to the production of dwarfed progeny.

54 Hayman, B. I.
**The separation of epistatic from additive and dominance variation in generation means.**
Heredity 1958 : **12** : 371–90.
Anderson and Kempthorne showed how comprehensive information on additive, dominance and digenic epistatic variation derived from the means of generations descended from two

inbreds could be expressed by six parameters. The author proposes a different but related set of parameters for the same purpose; *d*, measuring pooled additive effects; *h*, pooled dominance effects; *i*, pooled interactions between additive effects; *j*, pooled interactions between additive and dominance effects; *l*, pooled interactions between dominance effects; and *m*, the $F_2$ mean. The procedure described is first to fit *m*, *d* and *h* to the observed means and test for goodness of fit, and then, if $\chi^2$ is significant, fit *m*, *d*, *h*, *i*, *j* and *l* and retest. Examples are given with reference to published data on quantitative inheritance in tomatoes and *Nicotiana rustica* and to unpublished data on wheat provided by L. G. Copp.

Epistasis was found to occur widely and constitute an important component of genetic variation. The three epistatic components measured by *i*, *j* and *l* can be present in any combination of sign and magnitude.

A theoretical difficulty arises in that the measures of additivity and dominance cannot be made independent of epistatic interactions.

55 Furness, G.
**The transfer of motility and tyrosine requirement to *Escherichia coli* strain B by recombination with *E. coli* strain K12.**
J. gen. Microbiol. 1958 : **18** : 782–86.

"Motile recombinants may be obtained by crossing *Escherichia coli* strain K12, F+, with the non-flagellated strain *E. coli* strain B, F−. The flagella of the recombinants have the same antigenic pattern as those of the F+ parent and the locus controlling motility is linked to loci controlling tyrosine requirement and fermentation of arabinose and galactose ($gal_5$)."
[Author's summary].

56 Hagiwara, A.
**Recombination ability of *Escherichia coli* K-12 protoplasts.**
Nature, Lond. 1958 : **182** : 456–57.

Evidence was obtained of a one-way transfer of genetic material from $F^+$ protoplasts to intact $F^-$ cells.

57 Bresch, C. & Starlinger, P.
Zum Problem der genetischen Rekombination von Bakteriophagen. Die Hypothese der kompletten Kooperation. (**On the problem of the genetic recombination of bacteriophages. The hypothesis of complete cooperation**).
Z. VererbLehre 1958 : **89** : 459–68.

A theory of genetic recombination in phages is developed in which $N + 1$ random templates participate in the formation of a new replica carrying *N* recombination sites. Several models are described by which such recombination could be effected. A differential equation describing the hypothesis of complete cooperation is given and formulae developed from this equation are compared with those for the mating theory of Visconti and Delbrück. [Cf. XXIII, 1767].

58 Edgar, R. S.
**Phenotypic properties of heterozygotes in the bacteriophage T4.**
Genetics 1958 : **43** : 235–48.

"The experiments reported here indicate that all, or virtually all, phage particles heterozygous for a single pair of *r*II and *r*II+ alleles have an *r*II+ phenotype in K12 (λ) bacteria. On the other hand, particles heterozygous at two *r*II loci in the *trans* position have a mutant phenotype in K12 (λ), provided the two markers are in the same cistron. If the markers are in different cistrons, most, if not all double heterozygotes have an *r*II+ phenotype.

"Certain implications arise from these observations in respect to the analysis of recombination and the structure and phenotypic action of the phage genome. Recombination analyses which utilize the *r*II–K system may be subject to some qualification, for it has been shown that no reliable estimate of the map distance between two *r*II markers in different cistrons can be made from the measurement of plaque forming particles on K12 (λ) bacteria. Although the experiments reported here do not distinguish between the 'partial replica' and 'diploid' models of heterozygote structure, fewer assumptions need be applied to the latter model in order to account for the results obtained."
[Author's summary].

59 Jinks, J. L. & Jones, R. M.
**Estimation of the components of heterosis.**
Genetics 1958 : **43** : 223–34.

Heterosis can be partitioned into four components expressing the role of additivity, dominance, nonallelic interaction and the degree of association or dispersion of the relevant genes in the homozygous parents. The components can be estimated from the parental, $F_1$, $F_2$ and back-cross means. Heterosis does not indicate any particular type of gene action or interaction but it is more frequent and has a higher mean expression when nonallelic interactions are operative. The type of analysis described is exemplified with reference to diallel-cross data involving inbred lines of *Nicotiana rustica*.

60 Dierks, W.
Untersuchungen zum Heterosisproblem. **(Investigations on the problem of heterosis).**
Z. Pflanzenz. 1958 : **40** : 67–102.

A brief survey of hypotheses on the nature of heterosis is presented and experiments are described in which 15 early and late-flowering races of *Arabidopsis thaliana* were intercrossed. Some hybrids from crosses between early races showed heterosis in respect of late flowering and in vegetative vigour. The $F_1$, $F_2$, $F_3$ and back-cross populations of the cross Catania wenig behaart [Catania Sparsely Hairy] x Enkheim were studied in detail; it was found that the transgression arose from interaction between a main factor for late flowering from Catania wenig behaart and dominant modifying genes from Enkheim also having a delaying effect on flowering. Such a heterotic effect, which is not dependent on superdominance, may be fixed.
Heterosis in self and cross pollinated plants is discussed; it is thought that this essentially depends on gene interaction.

61 Astrov, A. V. & Gorjunov, D. V.
**(Distant hybridization, an important problem of national economy. A coordinating conference in Moscow).**
Vestn. Akad. Nauk SSSR (Rep. Acad. Sci. USSR) 1958 : **28** : No. 6 : 116–18. [Russian].

This report on the conference mentions briefly some results obtained in the USSR by crossing distantly related species of a diversity of agricultural, horticultural and industrial plants and of ornamental and economic forest-tree species. Most of the results have been reported in *Plant Breeding Abstracts*. Worth mention are new wheats adapted to cultivation on virgin land. They were obtained by crossing *Triticum vulgare* with *T. durum* or *T. dicoccum*. Also mentioned is a heterotic hybrid of *Sorghum* 'Gigant Uzbekistana' [Uzbekistan Giant]. It grows to a great height and yields 1200–1500 c. green matter and 50 c. grain per ha. Among the new forms of forest trees obtained are hybrids of *Larix kamtschatica* from pollination with a pollen mixture of *Sequoia* + two unidentified species of cedar and cypress.

62 Jacob, F. & Wollman, E. L.
Les épisomes, éléments génétiques ajoutés. **(Episomes, additional genetic elements).**
CR Acad. Sci., Paris 1958 : **247** : 154–56.

An episome is described as a genetic element which may or may not be present in a cell and which, when present, may be integrated or autonomous. Examples include the prophage, colicinogenic determinants [cf. 70] and the sexual factor in *Escherichia coli*.

63 Serra, J. A.
**Chromosomic units of genetic determination. 1. Two-dimensional composite nature of the gene in macroorganisms.**
Portug. acta biol. 1958 : **5** : 100–25.

A further development is presented of the author's previous theories on the nature of genetic units [cf. XXII, 6].
It is pointed out that a chromosome contains units of four orders: the chromosome itself, the genes, the chromonema segments or nemameres and the molecular groups or segments which make up the nemameres. A gene in the classical sense consists of a few nemameres. Only a subdivision of the gene into smaller units makes possible an explanation of position effects and some of the phenomena connected with allelism. Subdivision of genes may be visually distinguishable in the salivary chromosomes of *Drosophila*, where a unit of phenogenetic realization may occupy more than one band or be divisible into subbands. Genetic units may also be divisible with respect to the thickness of the chromonema. The number of double peptide or nucleotide chains of about 20 Å. diameter required to fill the diameter of a chromonema has been calculated as between $5 \times 10^2$ and $5 \times 10^3$. These chains in some cases have been shown by electron micrographs to be in the form of double helices of several orders. Genetic units in the chromonemata must therefore be composed of a number of replicated structures. During crossing over, the group of subunits forming a gene becomes individualized at the cytological level; it is thought unlikely that the genes remain individualized during other stages of cell life. This individualization may result from differentiation between intragenic and intergenic bonds of nemameres and nucleoproteins and metal ions may be involved in this. With respect to biochemical characters, a gene may correspond to an enzyme but in other cases a unitary effect in phenogenesis may result from a directional change in an equilibrium involving more than one substrate and enzyme.
"The classical gene or gene *sensu stricto* is thus to be maintained as an intermediary unit of organization and a gross unit of phenogenesis, but is neither obligatorily differentiated in all

of cell life, nor universally existent in micro and submicroorganisms, as it exists in macroorganisms".

64 SERRA, J. A.
**Proteins and nucleic acids as genetic determinants : apogenons and cogenons.**
Portug. acta biol. 1958 : **5** : 126–33.

Some of the existing knowledge of the nature of the genetic units of chromosomes and virus nucleotidonemata at the molecular level is reviewed. Evidence is presented indicating that nucleic acids alone cannot provide suitable templates for protein synthesis and that enzyme sites ultimately provided by the gene proteins are involved in this synthesis. "Nucleotide chains play a role in this synthesis, probably cooperating with the Prot [protein compound] sites in determining the specific sequences, for instance by combining with the chains in process of synthesis, at the measure that they are synthesized". Both nucleic acids and the protein compounds of the chromosomes are said to form genons, which are defined "as the minimum sites of polypeptide or polynucleotide chains, which alone or jointly are capable of determining specific genetic action". Apogenons are sites on the protein structures of the chromonemata where specific syntheses of polypeptides and polynucleotides are carried out; these sites may have a specific geometry capable of catalytic group orientation. The cogenons are specific sequences of nucleotides complementary to the apogenons; the two kinds of genons may adapt to each other in a manner similar to enzyme-substrate adaptation. Recombination and mutation may alter the sites as wholes or only parts of their chains. Mutation may result in different binding of the components of the genon sites and may alter their geometry. The genetic unit is capable of recombining or mutating without losing its identity.

The proteins of the chromonemata are fibrous structures in many cases consisting of repeated monomers; apogenon sites may be visualized as specific foldings along these chains of monomers or nemameres; groups of nemameres form the gene *sensu stricto* [cf. 63]. Viruses have only cogenon compounds; they obtain complementary proteins from the host cell.

65 SERRA, J. A.
**Divisibility of loci and types of alleles.**
Portug. acta Biol. 1958 : **5** : 134–38.

Using the model of the gene proposed by the author [cf. 63–64], it is possible to explain locus divisibility without introducing different concepts or units for recombination, mutation and phenogenesis. A gene, consisting of one or several chromonema segments or nemameres, may have several sites of genetic activity of the apogenon and cogenon type on each nemamere. During recombination, the nemameres may separate and complex subgenes may result. An example of intragenic recombination in *Neurospora crassa* is illustrated by means of a diagram. A classification of the subdivisions of gross alleles is presented. Holoalleles control the same minor physiological characters and have the same mutability; they are without residual recombination and have no cis-trans effect. Eualleles differ with respect to minor physiological characters and have different mutability; they also are without residual recombination and have no cis-trans effect. Pseudoalleles or suballeles are similar as regards gross physiological characters but differ in respect of minor physiological characters and mutability. They have residual recombination and a cis-trans effect. Quasialleles are neighbouring closely-linked genes; they behave generally as different loci but sometimes show intermediary pseudoalleles.

66 SERRA, J. A.
**Proposed genetic notation of alleles.**
Portug. acta biol. 1958 : **5** : 139–40.

It is proposed "that the pseudoalleles be represented by the designation of the factor with a subscript or superscript, as is usual, but not with a letter or a number of type equal to that of the designation of the gross locus. Eualleles should have a designation separated by a semicolon from the pseudoallele designation. Holoalleles should be designated by the same two superscripts or subscripts as eualleles, followed by a number or other designation inserted in parentheses. Subscripts are more appropriate than superscripts when + alleles are also represented". Thus a gross locus $g$ may have two pseudoalleles designated $g^1$ and $g^2$ or $g_1$ and $g_2$ or $g_A$ and $g_B$. Should $g^1$ have two eualleles these may be written $g^{1;a}$, $g^{1;b}$ or $g_{1;a}$, $g_{1;b}$. Three holoalleles of the latter may be designated $g_{1;b\,(1)}$, $g_{1;b\,(2)}$ and $g_{1;b\,(3)}$. The + allele of a holoallele would be written as $g_1{}^{+}{}_{;b\,(1)}$.

The application of this notation in the representation of crosses is considered. "For instance if the cross between 2 factors of the gross locus $b$ gives rare recombinants, there are at least 2 pseudoalleles at this gross locus. Supposing two other linked factors, $a$ and $c$, a cross between

$a.b_1.$ + x $+.b_2.c$, ordinarily so represented, becomes: $a.$ | $b_1.$ + | .+ x + . | $+.b_2$ | $.c$ or $a.$ | $b^1.+$ | .+ x +. | $+.b^2$ | $.c$ or preferably, $a.$ | $b_1.b_2^+$ | $c^+$ x $a^+.$ | $b_1^+ .b_2$ | $.c$. The cis-trans effect appears then simply as the case of junction of $b_1^+$ and $b_2^+$ to restore the original + gross locus formed by 2 sub-loci".

67 Serra, J. A.
**Explanations of negative interference and levels of recombination.**
Portug. acta biol. 1958 : **5** : 141–46.

Negative interference is considered to be real and an explanation of this phenomenon based on the author's model of genetic units is suggested [cf. 63–64].
Exchange between chromonema segments may take place when there is some interference with the conditions which bring about the unity of the nemameres forming the gene. Such a change may arise spontaneously or result from selection for recombinations within ever smaller regions; this *ipso facto* annuls or reverses the condition uniting subunits into a gross unit. When small segments are exchanged, two breaks separated by a small distance arise and multiple exchanges may appear. The mechanism of exchange of small regions is associated with helicization of the genetic units at submicroscopical levels and is thought to be similar to crossing over.

68 Nuždin, N. I.
**(The present state of the theory of material units of heredity).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 3–26. [Russian].

Research on the material units of heredity and directed variability, published in English, French, German, Italian or Russian, is reviewed.

69 Frédericq, P. & Papavassiliou, J.
Croisement génétique de souches d' *Escherichia coli* marquées par production de colicine I. (**Genetical crossing of *E. coli* strains marked by the production of colicin I**).
CR Soc. Biol., Paris 1958 : **151** : 1970–73.

In crosses of *E. coli*, the ability of one or the other parent to produce colicin I has no effect upon the transference of other characters. The $F^+$ parent is unable to transmit either the colicinogenic or the noncolicinogenic character; the recombinants are colicinogenic only when this character marks the $F^-$ parent.

70 Alfoldi, L., Jacob, F., Wollman, E. L. & Maze, R.
Sur le déterminisme génétique de la colicinogénie. (**On the genetic determination of colicinogeny**).
CR Acad. Sci., Paris 1958 : **246** : 3531–33.

The inheritance of the colicinogenic character in *Escherichia coli* was studied by determining the frequency of transmission of $col^+$ in the cross Hfr $col^+$ x $F^-$ $col^-$ and the frequency of lethal zygosis in the cross Hfr $col^-$ x $F^-$ $col^+$. Four different Hfr strains were used and it was found that the time and frequency of transmission of the determinant $col^+$ differed in the different strains, early transference being associated with high transmission. Transmission being dependent upon the chromosomal organization of the donor, it was possible to determine that the colicinogenic character was situated near *TL*, between *TL* and $MB_1$.
In the cross Hfr $col^+$ x $F^-$ $col^-$, all the progeny of a zygote receiving $col^+$ are colicinogenic, while in Hfr $col^-$ x $F^-$ $col^+$, almost all the descendants of a zygote with $col^-$ die after a few divisions. It is suggested that when $col^+$ is transferred to $col^-$ bacteria, the former factor is released from the chromosome and undergoes autonomous multiplication more rapidly than the bacterial chromosome, to which it later becomes attached and with which it then multiplies simultaneously.

71 Rappaport, H. P.
**Induction of a lysogenic *Escherichia coli* with alpha and deuteron particles.**
Arch. Biochem. Biophys. 1958 : **76** : 1–14.

It was found that $\alpha$ and deuteron particles could induce lysogeny in *E. coli* and that the cross section for induction was correlated with the number of nuclear bodies in the cell; cells killed by irradiation could still be lysogenized. "On the basis of target theory a thin (50 A.) physical structure with cross section 8 x $10^{-10}$ sq. cm. for log phase cultures is deduced as the carrier of the constraint against phage synthesis."

72 Böhme, H. & Taubeneck, U.
Die Wirkung von Bakteriophagen auf Normalformen und "large bodies" von *Proteus mirabilis*. (**The effect of bacteriophages on normal forms and "large bodies" of *P. mirabilis***).
Naturwissenschaften 1958 : **45** : p. 296.

Penicillin-induced large bodies of *P. mirabilis* reacted to phage infection in a manner similar to that of normal phage-susceptible cells; all the large bodies were completely lysed. Large

bodies originating from phage-resistant strains were not lysed by phages. In these respects the large bodies of *P. mirabilis* differ from protoplasts obtained from *Bacillus megaterium* by lysozyme treatment.

73 Kohoutová, M.
**Effect of monovalent cations on type specificity transformation in pneumococci.**
Nature, Lond. 1958 : **182** : 188–89.

Investigations were carried out at the Institute of Biology, Czechoslovak Academy of Science, to study transformation of the R form of *Diplococcus pneumoniae* type II into the mucous form of *D. pneumoniae* type III. The presence of salts with monovalent cations (dipotassium hydrogen phosphate, disodium hydrogen phosphate, potassium chloride, sodium chloride and to a lesser degree ammonium sulphate and ammonium chloride) in a neopeptone anti-R serum medium enhanced the rate of transformation.

74 Gillissen, G.
Die Induktion von Penicillinresistenz bei *M. pyogenes* var. *aureus* durch Desoxyribonucleinsäure (DNS) von sensiblen und resistenten Staphylokokkenstämmen. [**The induction of penicillin resistance in *Micrococcus pyogenes* var. *aureus* by deoxyribonucleic acid (DNA) from susceptible and resistant *Staphylococcus* races**].
Naturwissenschaften 1958 : **45** : p. 297.

It has already been shown for other bacteria that DNA from a resistant strain may induce penicillin resistance in a sensitive strain [cf. XXIII, 5]. This is now shown to be true for *M. pyogenes* var. *aureus*. It was also found that DNA from a sensitive strain induced resistance, this action being prevented by the addition of deoxyribonuclease.

75 Adams, J. N. & Luria, S. E.
**Transduction of bacteriophage P1: abnormal phage function of the transducing particles.**
Proc. Nat. Acad. Sci. USA 1958 : **44** : 590–94.

The introduction of transduced factors by a single phage particle into a recipient cell of *Shigella dysenteriae* or *Escherichia coli* was generally not accompanied by the formation of phage-carrier cells. The following three possible explanations are briefly discussed: (1) most transducing particles do not carry a phage genome, (2) the particles carry an abnormal genome incapable of establishing lysogeny or (3) the establishment of transduced factors may be selective at the expense of the phage genome in the same cell.

76 Michaelis, P.
Über die Bedeutung des plasmatischen Erbgutes für die Mannigfaltigkeit der Gattung *Epilobium*. (**On the significance of cytoplasmic hereditary material for the variability of the genus *Epilobium*).**
Biol. Zbl. 1958 : **77** : 165–96.

Induced gene mutations of *E. hirsutum* were not expressed in hybrids with untreated *E. parviflorum*, but gene mutations of the latter species resulted in marked disturbances in growth in the cross *E. hirsutum* ♀ x *E. parviflorum*, i.e. in hybrids with *E. hirsutum* cytoplasm; the reciprocal cross was unaffected. In segregating generations, numerous different phenotypes occurred according to the cytoplasm in which the mutant gene was expressed. Through plasmon recombination [cf. XXVII, 1050] many of the aberrant hybrids produced side shoots which differed from the rest of the plant and which could be propagated vegetatively. Some of the changes were unstable and underwent further spontaneous modifications, those with the best growth being the most stable and those showing the greatest disturbances the least; the latter were often highly sterile. Where crosses were possible, the changes were maternally inherited. The phylogenetic significance of this type of variation is discussed.

77 Michaelis, P.
Untersuchungen zur Mutation plasmatischer Erbträger, besonders der Plastiden. II. Teil. (**Investigations on the mutation of plasmatic hereditary factors, especially the plastids. Part II**).
Planta 1958 : **51** : 722–56.

Induced mutants of the *albomaculatum* type [cf. XXVIII, 3680] fell into eight groups on the basis of microscopic differences among the plastids. In each group, both plastome mutation and mutation of other cytoplasmic factors appeared to be involved, the former evidenced by the presence of cells with more than one kind of plastid. In most of the mutants degeneration of the plastids sets in at varying stages of development and this may be accompanied by secondary effects leading to disturbances of cell division and anatomical abnormalities. Crosses among *albomaculatum* and normal plants showed non-Mendelian maternal inheritance of the mutant character, and no evidence of transmission by the male parent was obtained.

78 Mandel, S. P. H. & Hughes, I. M.
**Change in mean viability at a multiallelic locus in a population under random mating.**
Nature, Lond. 1958 : **182** : 63–64.

It is shown mathematically that when a large randomly mating population is near the equilibrium state in respect of a multiallelic locus, the mean viability increases from one generation to the next.

79 Fisher, R. A.
**Polymorphism and natural selection.**
J. Ecol. 1958 : **46** : 298–93.

Further to the controversy between Cain and Sheppard [XXVII, 54], on the one hand, and Li [XXVI, 850], on the other, on polymorphism, adaptation and selection, the author brings forward reasons in favour of the view that balanced polymorphism may be advantageous from the evolutionary point of view. In particular, an analogy is drawn between randomized strategy in card games and competition between polymorphic species in nature.

80 Mode, C. J.
**A mathematical model for the coevolution of obligate parasites and their hosts.**
Evolution, NY 1958 : **12** : 158–65

A mathematical model for a host-pathogen system of evolution is proposed, with reference to Flor's finding of complementary genetic systems in the flax host and its parasite *Melampsora lini*. It is also shown how linkage of genes for host resistance to a pathogen, as described by Briggs and his associates in the case of reaction to *Tilletia caries* in wheat and to *Erysiphe graminis* in barley, may also lead to a host-pathogen system of evolution. It is suggested that the genetic systems disclosed by the work of Flor and Briggs are the relics of ancient systems of balanced polymorphism, originating from the time when wheat, barley and flax reproduced by outbreeding. It is further suggested that dual systems of balanced polymorphism, one in the host and the other in the pathogen, were in fact necessary for the coevolution of obligate parasites and their hosts.

81 Banič, S.
**Isolation of Lac$^+$ mutants from a Lac$^-$ strain of *Escherichia coli*, by the replica plating technique.**
J. gen. Microbiol. 1958 : **18** : 586–90.

"Lactose-fermenting (lac$^+$) mutants were isolated from a nonlactose-fermenting (lac$^-$) strain of *Escherichia coli*, strain O 110, by the replica plating technique. When high dilutions of a 24 hr. broth culture of the strain were plated on Endo agar, to give discrete colonies, secondary lac$^+$ colonies began to appear in the initially lac$^-$ colonies after 3 days' incubation; after 10 days, over 50% of colonies contained secondary lac$^+$ colonies. Twenty serial subcultures were made in broth containing lactose, each subculture being incubated for only 6 hr. to prevent selection of lac$^+$ mutants from exhaustion of other nutrients while exposing the bacteria to lactose during many generations. When heavy inocula from the final subcultures were plated on Endo agar, no more lac$^+$ colonies appeared than from control platings of broth cultures which had not been exposed to lactose. An R variant of the lac$^-$ strain of *E. coli*, strain O 110, was found to assimilate lactose to a considerable extent without fermentation; the original S form possessed this capacity only to an insignificant extent."

[Author's summary].

82 Hill, R. F.
**The mutation of *Escherichia coli* to resistance to bacteriophages T1 and T1*s*.**
Z. VererbLehre 1958 : **89** : 355–72.

It has been found that the number of phage-resistant mutants in unirradiated and ultraviolet-irradiated cultures of *E. coli* strains B and B/r is usually greater when the selecting agent is T1s. Studies are now described which show that this cannot be explained by (*a*) completely independent gene changes, (*b*) the presence of host range phage mutants or (*c*) new mutations due to prolonged survival of wild type bacteria in the presence of phage. On the other hand the evidence suggests that the presence of incompletely expressed bacterial mutants in the cultures before plating may explain the difference in selection by T1 and T1s. This indicates the existence of a phenotypic lag. The development of resistance to T1s is thought to precede the development of full resistance to both phages.

83 Bradley, S. G.
**Mechanism of 'vegetative hybridization' in Streptomyces.**
J. gen. Microbiol. 1958 : **18** : 591–96.

"A population of *Streptomyces griseus*, strain W107, exposed for several growth cycles to a sterile culture filtrate of *S. griseus*, strain M142, acquired several genetic characteristics similar to those of strain M142. The changes observed were: (1) streptomycin sensitivity to resistance; (2) bacteriophage $V_1$ sensitivity to resistance; (3) absence to presence of soluble pigment; (4)

presence to absence of pigment in the vegetative mycelium. The filtrate contained streptomycin and a temperate bacteriophage. The low concentration of streptomycin did not grossly inhibit the growth of strain W107 but streptomycin-resistant mutants were selected. Resistance to the temperate phage frequently conferred resistance to bacteriophage $V_1$. The observed morphological changes were coupled with bacteriophage- and streptomycin-susceptibility. Vegetative hybridization was the result of selection of mutants rather than gene transfer." [Author's summary].

84 Dubinin, N. P.
**(Principal factors of the natural mutation process).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1093–107. [Russian].

Many results are cited which show that mutation can no longer be regarded as a simple function of the temperature relationships of the molecules constituting the gene. Thus mutation of a given gene may be influenced by other genes, by the physiological state of the organism and by various chemical compounds, including the products of metabolism. Attention is called to the difference in proportion of certain types of mutation arising from treatments with different mutagens and to the absence of correlation between the mutability of a gene under natural conditions and its sensitivity to mutagens. It is concluded that mutation results from chemical changes occurring in the genetic material of the chromosomes; for this reason it should ultimately be possible to direct the mutation process, in which connexion the importance of DNA is pointed out.

85 Gause, G. F.
**Biochemical mutants in bacteria with impaired respiration.**
Nature, Lond. 1958 : **182** : 97–98.

Induced mutants in staphylococci, *Bacterium coli*, *B. paracoli* and *B. mycoides* with impaired respiration all have decreased $Q_{0_2}$ values and a diminished sensitivity to inhibition of their respiration by cyanide compounds. The respiratory deficiencies are however accompanied by dissimilar alterations of the cytochrome systems in the different bacteria.

86 Steinman, I. D., Iyer, V. N. & Szybalski, W.
**The mechanism of chemical mutagenesis. II. Interactions of selected compounds with manganous chloride**
Arch. Bichem. Biophys. 1958 : **76** : 78–86.

"Interactions between $MnCl_2$ and other mutagens, assessed by measuring changes in mutation rates from streptomycin-dependence (*sd*–4) to independence, and from cysteine-requirement (*cys*–2) to prototrophy in *E. coli*, Sd–4–73, varied from highly synergistic to less than additive (antagonistic). The combined action of $MnCl_2$ and azaserine exceeded the theoretical additive effect by a factor of 50. A few non-mutagenic substances influenced the $MnCl_2$ activity as promutagens or antimutagens. Most notable among them was actinomycin D, which, albeit inconsistently, was capable of almost completely suppressing the action of the mutagen." [cf. XXVIII, 3707].
[Authors' summary].

87 Prokof'eva-Bel'govskaja, A. A., Alihanjan, S. I., Kapitonova, O. N. & Erohina, L. I.
**[The cytology of radiation mutants of *Actinomyces* (*A. globisporus streptomycini* Kras.)].**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR): Ser. Biol. 1958 : No. 2 : 193–201. [Russian].

Treatment with doses of ultraviolet radiation of 10,000–15,000 ergs per mm.$^2$ produced mutant forms of *A. globisporus* var. *streptomycini*, which differed from each other and from the original strains as regards the basophilic characters of the cytoplasm during the early stages of development of the culture in an agar medium; these differences were related to RNA synthesis. Changes also occurred in the structure of the nuclear elements, their DNA content and their behaviour during cell division; the morphological characters of the colony and the life cycle of the culture were also affected. In strains LS–1 and 213, weakly sporulating, non-sporulating and strongly sporulating mutants were found and also forms which produced no streptomycin.

88 Zamenhof, S. & Greer, S.
**Heat as an agent producing high frequency of mutations and unstable genes in *Escherichia coli*.**
Nature, Lond. 1958 : **182** : 611–13.

Mutants of strain 15 and strain W6 were obtained by exposure to temperatures of 55 or 60° C. It was shown that the high numbers of mutants were actually produced by the heat and not merely selected by it from mutants present in the original cultures. The mutants included types with nutritional deficiencies such as may arise spontaneously or be easily induced by other mutagenic agents. Unstable and stable mutants forming pin-point colonies also

occurred. The unstable mutants resembled those induced by 5-bromouracil when it is incorporated into the deoxyribonucleic acid of the cells. By crossing one of the nutritional deficiency mutants with strain 1177, it was shown that the heat-induced mutants segregate and are not cytoplasmic.

These findings are thought to show that the mutagenic and unstabilizing effect of heat is of a different magnitude to that of other microbial mutagenic agents, with the exception of 5-bromouracil when it is incorporated into deoxyribonucleic acid. The heat treatment may have had its effect by unstabilizing deoxyribonucleic acid.

89 GREER, S. B.
**Growth inhibitors and their antagonists as mutagens and antimutagens in *Escherichia coli*.**
J. gen. Microbiol. 1958 : **18** : 543–64.

Thirty-five substituted benzimidazoles, benzotriazoles and quinoxalines were tested as growth inhibitors, using strain W of *Escherichia coli* and two of its purine-dependent mutants, $Wp^-$ and $Wah^-$, and *Tetrahymena geleii*. A number of the compounds, especially those with a nitro-group in the benzene ring, were inhibitory. Several of these analogues were tested for their mutagenic effect on the loci for guanine dependence and streptomycin sensitivity in mutant $Wp^-$. Only inhibitory compounds and non-inhibitory concentrations (10 and 20 $\mu$g./ml.) of 4-nitro-6-hydroxybenzimidazole (NHB) were mutagenic. No gene-specific mutagenesis was demonstrated. The increase in the rate of mutation due to NHB was detected by means of the papilla method; evidence was obtained which eliminated the possibility that selection of preexisting mutants was operative. NHB did not increase the frequency of mutants in nondividing cells and was not incorporated into the bacterial DNA. The mutagenic action of NHB may involve inhibition of enzymes concerned with DNA synthesis. DNA and RNA and their constituents, purine and pyrimidine precursors and analogues, and vitamin $B_{12}$ and other vitamins had no influence on growth inhibition or mutagenesis caused by NHB. Several aminoacid combinations and one non-mutagenic analogue, 4-hydroxy-6-nitrobenzotriazole, were however found to interfere with the mutagenic action of NHB. These compounds did not affect the frequency of spontaneous mutants. The antimutagenic action of the aminoacid combinations occurred only when they were present simultaneously with the mutagen. Antimutagenesis by aminoacids may involve their ability to increase the growth rate and thus to decrease the efficiency of the action of the mutagen, as well as modification of the inhibited nucleic-acid metabolism. Twenty-five inhibitors of nucleic-acid synthesis and antagonists of growth inhibitors were tested for mutagenic activity in strain $Wp^-$ and four other mutants of *E. coli*. Several compounds, including 6-mercaptopurine, were mutagenic. NHB, 5-nitroquinoxaline and 5-amino-uracil had a mutagenic effect on most of the strains. The antimutagenic activity of a combination of glutamic acid, serine and methionine was specific in respect of strain. The mixture did not depress the mutagenic effect of NHB and 5-nitroquinoxaline in any strain except $Wp^-$. Aminoacids had no effect on mutation induced by 5-aminouracil. Purine bases and ribosides annulled the mutagenic action of 6-mercaptopurine.

90 DE SERRES, F. J. (JUN.)
**Studies with purple adenine mutants in *Neurospora crassa*. III. Reversion of X-ray-induced mutants.**
Genetics 1958 : **43** : 187–206.

A series of 24 purple adenine-requiring mutants obtained in forward-mutation experiments by the filtration-concentration technique devised by Woodward *et al.* [cf. XXV, 734] was used to investigate the reversibility of X-ray-induced mutations in the *ad*–3 region. Three of the mutants were due to alteration of locus *ad*–3*A* while the remaining 21 involved *ad*–3*B*. The origin of the *ad*–3*A* mutants as the result of X irradiation was not however established with certainty. Two of the *ad*–3*B* mutants had partial requirements for adenine, B21 growing extensively and B16 showing limited growth on a minimum medium at 25° C. In the remaining mutants, requirement for adenine was complete. Eleven of the *ad*–3*B* mutants had normal linkage relationships in the *hist*–2—*ad*–3 and *ad*–3—*nic*–2 intervals and thus appeared to have arisen through intragenic alteration. Recombination data for one or both of these intervals in crosses of the remaining mutants at this locus departed from expectation, suggesting that these variants were the result of chromosomal change. Five of the 11 *ad*–3*B* with normal linkage relationships reverted to the wild type either spontaneously or after X irradiation, whereas all the mutants with recombination values departing from the standard ones were stable. X-ray treatment of *ad*–3*B* mutants induced partial reversals to the

wild type as well as complete reversals, both kinds of reversals being attributable in many cases to gene mutation. Tests on a partially-reverted strain induced by X rays indicated that it was capable of giving rise to the wild type spontaneously or after X irradiation.

91 **(On some problems of Soviet biology).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1135–45. [Russian].

In referring to recent articles by Lysenko [XXVIII, 3722–3], this editorial mentions that many branches of biology in which the Soviet Union was once prominent have been discontinued as a consequence of the Lysenko principles. These include the use of plant hormones, the induction of mutations and polyploids and the use of inbred lines for the production of hybrid maize. None of the evidence for intergeneric conversion has withstood criticism and the effect of the principle in practical agriculture has been an increase in the amount of weeds. Many workers, both in the Soviet Union and elsewhere, are cited as having failed to substantiate Lysenko's results on vegetative hybridization and Lysenko is accused of misunderstanding Darwin in stressing the random element and overlooking the materialistic role of selection in evolution. It is further mentioned that branched wheat has not fulfilled any of the promises made for it and is receiving no more attention, even in the research stations. The same applies to vernalization, intravarietal crossing and stubble planting. No varieties have been produced by vegetative hybridization.

92 Frolov, I. T.
**(On the dialectical-materialistic concept of determinism in biology).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 799–813. [Russian].

In connexion with the article by A. L. Tahtadžjan [XXVIII, 1180] the author explains the concept of dialectical determinism, the basic feature of which is that it takes into account the complex nature of causation and summates the effects of directly conditioned effects and the random effects not directly conditioned by environment. This essential concept, it is stated, has not been grasped by T. D. Lysenko, whereas Tahtadžjan is said to have overestimated the significance of the statistical outlook and the role of chance. A Mičurinist conception is suggested, according to which the hereditary constitution is compared to a memory, which gives a more or less definite reaction to impulses from a changed environment, those giving the most efficient reaction being preserved by selection. It is emphasized that the impulses may be many and complex and the final result will be determined by their interaction.

93 Šmal'gauzen, I. I.
**(On determinism and statistical laws in genetics).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1192–95. [Russian].

In referring to articles by A. L. Tahtadžjan [XXVIII, 1180] and I. T. Frolov [92], the writer expresses the opinion that complete freedom does not exist in biological processes, on account of the limitations imposed by the hereditary "code", the cell system and the organism as a whole, and thus they cannot be regarded purely statistically. Hence mutations are not necessarily entirely random. However, in connexion with the attempt to reconcile Mičurinism with modern genetics it is pointed out that mutation effects induced by DNA still comprise minute changes within the molecule and thus confirm rather than disprove the particulate nature of the units of inheritance. No concrete evidence exists for the assumption that changes occurring during the life of an individual are incorporated into its "memory" or information system but the statement that genes are excluded from the metabolic processes of the cell is shown to be in contradiction to the whole tenor of genetical thought.

94 Pettersson, M. L. R. & Gray, G. E. J.
**Further inherent characters of plant species of wetter and drier habitats.**
Nature, Lond. 1958 : **182** : 450–51.

A summary is given of the results of analysing 20 characters in intrageneric comparisons of one species from a damper habitat and another from a drier habitat. The plants were grown under the same environmental conditions and the six genera used were those studied previously [XXVIII, 214]. The observations suggested that in a drier habitat selection favours genotypes controlling the following characters: (1) leaves with less dilation (fresh weight/dry weight) and which possess greater dry weight, number of cells and total number of chromosomes, and (2) cells with less dilation which have lower water content, dry weight and cell volume per chromosome. Genotypes selected in a drier habitat may thus be regarded as having cells in which unit dry weight corresponds to a higher proportion of genes.

95 Robertson, A.
**Optimum group size in progeny testing and family selection.**
Biometrics 1957 : **13** : 442–50.
The general procedure advocated involves the testing ratio, *K*, the ratio of the number of individuals which can be measured each generation to the number of sires (or family groups) that are to be selected. The optimum structure of the population and the probably genetic superiority of chosen groups are then dependent only on *K*, the heritability and the genetic relationship within groups. The treatment is extended to cover problems arising from non-genetic differences between groups.

## EVOLUTION

96 Viehmeyer, G.
**Reversal of evolution in the genus Penstemon.**
Amer. Nat. 1958 : **92** : No. 864 : 129–37.
"The hypothesis is offered that evolution is, in a sense, reversible and that widely divergent germplasms may be returned to a common gene pool". At the North Platte Experiment Station, Neb., a series of intersectional hybrids in the genus *Penstemon* has made possible the production of a panmictic population combining the germ plasm of six sections of the genus. The intersectional hybrids are highly fertile and are also interfertile, factors for genetic isolation apparently having been inactivated in the hybrid germ plasm in most cases, although a few nonfruiting, presumably sterile individuals have been observed. The evolutionary significance of the development of this gene pool, with the concomitant disappearance of the system of genetic and spatial isolations enabling species to exist as separate entities in nature is discussed. It is suggested that controlled evolution of divergent lines from the gene pool may be brought about, simulating natural evolutionary processes.

**Darwin-Wallace centenary.**
J. Linn Soc. : Bot. Ser. : 1958 : **56** : No. 356 : 1–152.
This number of the above publication is issued in commemoration of the joint contribution of Darwin and Wallace to the Linnaean Society of London on 1 July 1858, announcing their independent discovery of the principle of evolution by natural selection. Among the papers are the following:—

97 *Huxley, J. The emergence of Darwinism. (pp. 1–14).*
Darwin's contribution to the development of evolutionary biology is assessed and the stimulus his work has given to a psychosocial approach to human destiny is emphasized.

98 *Corner, E. J. H. Transference of function. (pp. 33–40).*
It is suggested that many evolutionary changes in plants are the result of transference of a hereditary property to another part of the plant body. This concept of transference of function is explained by examples from the flower, fruit, seed and leaf of angiosperms.

99 *Gibbs, R. D. Chemical evolution in plants. (pp. 49–57).*
A historical review is given of attempts to relate biochemical characteristics with morphological evolution.

100 *Matthews, L. H. Darwin, Wallace, and "preadaptation". (pp. 93–98).*
The author argues that the time at which Darwin and Wallace published their ideas concerning organic evolution was ripe from the point of view of the intellectual climate of the period and that in this sense the two biologists may be said to have been "preadapted," the concept of evolution being by no means new. He also briefly shows how their speculations were limited by lack of modern genetical knowledge.

101 *Pontecorvo, G. The versatility of heredity. (pp. 116–22).*
A discussion is given of the following five types of recombination in terms of self replication of a linear genetic code: (1) recombination in viruses, (2) transformation in bacteria, (3) conjugation in *Escherichia coli*, (4) transduction in *E. coli* and *Salmonella* and (5) the parasexual cycle in fungi. The significance of (5) in considering the possible mode of evolution of the diploid condition in somatic cells of higher organisms is indicated.

102 *Thomas, H. H. Fossil plants and evolution. (pp. 123–35).*
After pointing out that the geological record of plant life as known to Darwin and Wallace provided no support for the theory of evolution, the author gives an evaluation of the evidence offered by modern paleobotany in favour of the theory.

103 *Turrill, W. B. The evolution of floras with special reference to those of the Balkan peninsula. (pp. 136–52).*
Chiefly with reference to the angiospermous

flora of the Balkan Peninsula, the author discusses the steps involved in the study of the evolution of floras and the synthetic approach required, and the role of (1) *in situ* development due to genetic changes, hybridization and extinction, and (2) immigration and emigration.

104 Ivanov, N. D.
**(Selection and mutual relations between organisms).**
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.): Otdel. biol. (Biol. Ser.) 1958 : **57** : No. 6 : 5–13.

Darwin's concept of competition is examined mainly in the light of his own writings. Overpopulation and interspecific and intraspecific competition are accepted as integral parts of Darwin's theory and are dissociated from Malthus. Overpopulation is thought not to occur among the cultivated plants.

105 Lederberg, J. & Cowie, D. B.
**Moondust.**
Science 1958 : **127** : 1473 – 75.

It is pointed out that information of value in elucidating the problem of prebiotic organic synthesis and in testing Arrhenius' hypothesis of panspermia is to be expected from a study of the cosmic dust on the surface of the moon. Should missiles from the earth land on the moon, contaminants from the earth may seriously reduce the scientific value of the lunar surface material.

106 Malygin, Ju. N.
**(How to name varieties).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : 52–55. [Russian].

Already approved proposals for a simpler nonduplicating and more uniform Soviet system of naming varieties of economic plants are discussed. The names of foreign varieties such as the cabbage Perfection are not to be translated into Russian but are to be transliterated in such a way that the Russian name closely resembles the original phonetically. Thus Perfection becomes Perfekšen.

107 Heine-Geldern, R.
Kulturpflanzengeographie und das Problem vorkolumbischer Kulturbeziehungen zwischen Alter und Neuer Welt. **(The geography of cultivated plants and the problem of the precolumbian cultural contacts between the Old and New Worlds).**
Anthropos 1958 : **53** : 361–402.

Attention is drawn to some inconsistencies in the statements in Merrill's book on Cook's voyages [XXV, p. 636] concerning weeds, two American species at least having been shown to be present in Polynesia before the voyages. The evidence for the presence of maize in Asia in precolumbian times [cf. XXI, 1009] is examined; though it is conflicting, the grounds for Merrill's view that maize and *Amaranthus* spp. were taken to India by the Portuguese from Brazil are considered unconvincing, a precolumbian introduction being thought to have greater verisimilitude. Merrill's criticisms of the views of Hutchinson *et al.* [XIX, p. 183] are styled "foolish"; a more serious difficulty for these views is the discovery of cotton fabrics in Peru dating from the 3rd millenium BC; reference is however made to evidence that cotton was cultivated in Tahiti before the advent of the Europeans. A number of reasons, based on ethnic and religious grounds, why more plants from the Old World were not adopted, in spite of the cultural contact that may have existed, are analysed, it being emphasized that the contact consisted of occasional arrivals in America of small groups of individuals from Asia rather than colonial occupations. Evidence showing the possible character of these colonists is found to agree with the supposition that they would not have been interested in bringing cultivated plants with them to America though they may quite possibly have brought maize, *Amaranthus leucocarpus* and *A. caudatus* back to Asia. The Dongson tribes of Tongking and northern Annam are stated to have travelled to Peru, and hence possibly also to Colombia, in the second half of the 4th century BC and may quite possibly have brought maize from there. This would account for the similarity between the maize races of Assam and those of Colombia [cf. XXIII, 1928].

## CYTOLOGY

**Abstracts of papers presented at the International Congress of Radiation Research, Burlington, Vermont, August 10–16, 1958.**
Radiation Res. 1958 : **9** : 84–206.

108 *Burns, V. W. Studies of the relative biological effects of 30- and 70-Mev electrons and the production of color mutants in an adenine deficient yeast. (pp. 96–97).*

A yield of up to 5% white mutants per survivor was obtained after X irradiation at 15 kr. of a red adenine-deficient (*ad*2) yeast. The mutants were stable, were not petites and retained their

original adenine deficiency at the *ad2* locus without in most cases showing any new mutation at other known adenine loci.

109 *Doudney, C. O. & Haas, F. L. Modification of survival and mutation in ultraviolet-exposed bacteria by postirradiation treatment.* (*p. 108*).

A "mutation frequency decline" may be brought about for certain mutations caused by ultraviolet irradiation by postirradiation treatments including conditions limiting aminoacid or protein synthesis. The relation between mutation frequency decline and recovery is briefly discussed.

110 *Evans, H. J. & Neary, G. J. The meaning of the oxygen effect in the interpretation of chromatid aberrations.* (*p. 111*).

Evidence is presented and discussed supporting the hypothesis that all aberrations result from an exchange process and are not due to primary breakage.

111 *Kølmark, G. Patterns of interaction between X-rays and chemicals as studied by reverse-mutation rates in Neurospora.* (*p. 140*).

"In the present experiments, an attempt was made to study the interaction of X-rays and chemicals when these agents are applied simultaneously. Several different types of interaction have been found: (1) For chemicals that are nonmutagenic, there are those that, when combined with X-rays, give a decrease and others that give an increase in the rate of reverse-mutation as compared to the rate found with X-rays alone; and (2) for chemicals that are mutagenic, there are those that, when combined with X-rays, give an effect on the rate of reverse mutation that is more than additive, and others where the effect is less than additive." [From author's summary].

112 *Mikaelsen, K. The effect of polyploidy on the radiosensitivity of rye exposed to neutron radiation.* (*p. 154*).

The following differences were observed between diploid and tetraploid rye after irradiation: (1) the relative reduction in growth rate was less in the tetraploid plants; and (2) a greater fragment frequency was observed in tetraploid root-tip cells but when calculated as number of fragments per chromosome no difference could be demonstrated.

113 *Moutschen, J. Cystamine as a modifier of chromosome breaks caused by maleic hydrazide in broad bean.* (*p. 156*).

Cystamine was found to decrease the number of breaks although the frequency of reunions was not proportionally increased.

114 *Sparrow, A. H. & Schairer, L. A. The radioresistance of high polyploids.* (*p. 187*).

Tolerance of chronic $\gamma$-irradiation from $Co^{60}$ was found to increase with increasing polyploidy in species of *Chrysanthemum* with chromosome numbers of 18, 36, 72, 90 and 198 and in species of *Sedum* with chromosome numbers of 20 to 68. In the second case doubling the chromosome number did not double the tolerance and it is expected that the relationship may vary with the genus and type of polyploidy involved. In other cases tetraploids do not show greater tolerance than related diploids and it is pointed out that in many cases the tetraploids are known to be induced polyploids, although the significance of this observation is not yet clear.

115 *Wettstein, D. von, Ehrenberg, L. & Gustafsson, Å. Induced mutations in the improvement of cultivated species.* (*p. 200*).

A general discussion of the topic is given.

116 Zhinkin, L. N. & Mikhaĭlov, V. P. **On "The new cell theory."** Science 1958 : **128** : 182–86.

Two Soviet authors review recent work in the USSR on the origin of the cell and express the view that the hypotheses of O. B. Lepešinskaja and her coworkers have been invalidated by experimental evidence.

117 Astaurov, B. L. (**Differential effects of radiation injury upon the nucleus and the cytoplasm as a result of their functional specificity**). Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel. biol. (Biol. Ser.) : 1958 : **63** : No. 1 : 35–50. [Russian].

Research during the last 40 years is reviewed with special attention to experiments differentiating between the nucleus and the cytoplasm with regard to susceptibility to radiation injury. It is concluded that, in general, radiation damage is primarily due to nuclear injury.

118 Žukov-Verežnikov, N. N., Pehov, A. P. & Lysogorov, N. V. (**The biological and physicochemical laws of heredity**). Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1958 : **45** : 234–45. [Russian].

This review of research on the biological, chemical and physical properties of the nucleus in English, French and Russian publications culminates in the following conclusions. Many interesting facts which might throw light on

the mechanism of heredity have been amassed. However the treatment of these facts by formal geneticists has been both one-sided and narrow and hampers the progress of future investigations. Especial obstacles have been created by the theory that DNA, while capable of causing heritable changes, is itself not subjected to directed changes arising from internal conditions within the organism.

119 Flint, F. F. & Johansen, D. A.
**Nucleocytoplasmic relationships in the Fritillaria type of megagametogenesis.**
Amer. J. Bot. 1958 : **45** : 464–73.

"In several species of the Liliaceae, homogeneous material is extruded from within the nucleolus into the nucleoplasm, thence, together with most of the latter, through nucleodesmata into the megasporocytic cytoplasm. Subsequently, these substances, by assuming a variety of forms and functions, control or participate in many nuclear activities; they form the tractile elements of spindles, hold nuclei in position or cause them to move (as during the migration phase of the first four-nucleate stage), presumably cause the three chalazal spindles to fuse, and determine the respective functions of the nuclei in the maturing megagametophyte." [Authors' summary].

120 La Cour, L. F. & Pelc, S. R.
**Effect of colchicine on the utilization of labelled thymidine during chromosomal reproduction.**
Nature, Lond. 1958 : **182** : 506–08.

On the basis of experiments on *Vicia faba* roots, it is concluded that the results obtained by Taylor *et al.* [XXVII, 2508] were largely due to the extended treatment with colchicine which they employed and especially to the fact that only the $X_2$ period of chromosome replication took place in the presence of this agent. As a working hypothesis, it is suggested that each chromosome consists of four strands before duplication and that each chromatid after replication is usually made up of two new and two old strands. The observed appearance of equally labelled chromatids at both $X_1$ and $X_2$ mitosis, as observed by the authors, would thus be explicable. It is further suggested that colchicine may influence the segregation of new and old strands and hence the distribution of new and old DNA. Other possibilities which should be considered are (1) disparities in the time of replication of the chromosomes of a single cell and of the heterochromatic and euchromatic regions, and (2) somatic crossing over.

121 Marvin, D. A., Spencer, M., Wilkins, M. H. F. & Hamilton, L. D.
**A new configuration of deoxyribonucleic acid.**
Nature, Lond. 1958 : **182** : 387–88.

A third configuration of DNA has been observed by lowering the relative humidity of the lithium salt from 66 to 44%. The new configuration is explicable in terms of the Watson-Crick model, assuming that the base pairs are slightly shifted away from the helix and tilted by *ca.* 5°; the pitch of the helix would correspond to 9·3 base pairs per turn.

122 Chargaff, E.
**(Recent studies on nucleic acid specificity).**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1958 : No. 2 : 144–48. [Russian].

A short review in Russian is given of recently devised techniques for distinguishing between DNA samples of diverse origin, even though the base composition is identical.

123 Zubay, G.
**A possible mechanism for the initial transfer of the genetic code from deoxyribonucleic acid to ribonucleic acid.**
Nature, Lond. 1958 : **182** : 112–13.

The following hypothesis on information transfer from DNA to nuclear RNA is suggested. Base pair adenine-thymine I in DNA → guanine in RNA; adenine-thymine II → cytosine; guanine-cytosine I → uracil; and guanine-cytosine II → adenine. There are two variants for each of the base pairs in DNA according to which of the two chains each nucleotide occupies. If this hypothesis is correct (adenosine + thymine)/(guanine + cytosine) in DNA should equal (guanine + cytosine)/(adenine + uracil) in nuclear RNA. Data published on the nucleotide composition of DNA and nuclear RNA from four sources by Chargaff and Vincent exemplify this equivalence.

124 Meselson, M. & Stahl, F. W.
**The replication of DNA in *Escherichia coli*.**
Proc. Nat. Acad. Sci. USA 1958 : **44** : 671–82.

The distribution of $N^{15}$ among molecules of bacterial DNA was investigated following the transfer of a uniformly $N^{15}$-substituted *E. coli* population to a $N^{14}$ medium. The technique of isotopic differentiation was density-gradient centrifugation in concentrated CsCl solution.

Before one generation had elapsed, both fully and half labelled DNA molecules were present. After the first generation, all the molecules were half-labelled. After two generations, half-labelled and unlabelled molecules were present in equal amount.
These results support the Watson-Crick model of DNA replication in which each daughter molecule derives one of its two strands from the parent molecule while the other is newly synthesized.

125 Hyde, B. B. & Paliwal, R. L.
**Studies on the role of cations in the structure and behavior of plant chromosomes.**
Amer. J. Bot. 1958 : **45** : 433–38.
Treatment with the disodium salt of ethylenediaminotetraacetic acid (EDTA) at a concentration of 0·001 M and pH 7·5 for as short a period as 15–30 min. was lethal to onion root tips if, at the end of this time, the roots were immersed in distilled water with no further treatment. The meristems recovered, however, from a treatment for 45 min. at this concentration if placed in distilled water for up to 6 hr. and then transferred to a 0·001 M $CaCl_2$ solution. At the end of a 45-min. treatment, no visible changes were detected in the chromosomes, in comparison with the control material in distilled water. At the end of a 5-hr. period in distilled water after the EDTA treatment, swelling of the chromosomes and abnormal connexions between neighbouring chromosomes were observed. By means of a modified Barrnett and Seligman histochemical test, an increase in chromosomal sulphydryl groups was demonstrated in EDTA-treated roots. Using the Flax and Himes azure B procedure, cytoplasmic ribonucleoprotein was also shown to be modified. The effect of the chemical on chromosome structure is interpreted as being due to a loosening of the bonds between RNA and its associated protein. Further evidence on the role of cations in affecting chromosome behaviour was obtained from *Plantago ovata* plants grown in nutrient media with excess and deficiency of Ca or Mg [XXVIII, 1391].

126 Klein, D. T.
**Randomness of nuclear distribution in conidia of *Neurospora* heterokaryons.**
Z. VererbLehre 1958 : **89** : 323–27.
Heterocaryons of *N. crassa* were produced from homocaryotic macroconidial mutants with nutritional deficiencies. Statistical studies showed that there is a random distribution of nuclei in the macroconidial populations of the heterocaryons, this distribution being unaffected by the genotypes of the mutants involved or by an increase in the relative proportion of the homocaryotic conidia. These findings appear to contradict those of other workers. [Cf. XXIV, 874 and XXVI, 953].

127 Levine, M. & Curtiss, R.
**A genetic test for side-chains in a phage chromosome.**
Nature, Lond. 1958 : **182** : 126–27.
The test was made by means of spontaneous mutants of the temperate phage P22 of *Salmonella typhimurium*. The mutants, which all produced plaques with clear centres, can be classified into one of three phenotypic groups, $c_1$, $c_2$ and $c_3$, based on their ability to lysogenize. The groups correspond to three closely-linked pseudoallelic series, which behave as the functional units or cistrons referred to by Benzer [cf. XXVIII, 1074]. The alleles of the different series interact to give lysogeny, whereas the alleles of the same series do not. The *c* region is flanked by marker loci for plaque morphology. The data obtained on the frequencies of turbid recombinants belonging to different classes did not support the concept of a side-chain model but were in accordance with a linear structure of the chromosome.

128 Truhaut, R. & Deysson, G.
Étude comparée de l'activité antimitotique de la bis-éthylèneimino-2.5 dipropoxy-3.6 benzoquinone-1.4 (E39) et de la *p.* benzoquinone sur les racines d'*Allium sativum* L. [**Comparative study of antimitotic activity of bis-ethyleneimino-2.5–dipropoxy-3.6–benzoquinone-1.4 (E39) and of p- benzoquinone on the roots of *A. sativum***].
CR Soc. Biol., Paris 1958 : **151** : 1678–80.
The first compound has a rapid lethal action at concentrations of $8{\cdot}17 \times 10^{-7}$M, an irreversible mitostatic action at $4{\cdot}8 \times 10^{-7}$M – $2{\cdot}5 \times 10^{-8}$M, a reversible mitostatic action at $1{\cdot}25 \times 10^{-8}$M – $6{\cdot}25 \times 10^{-9}$M and no effect below $1{\cdot}56 \times 10^{-9}$M. The second is lethal at $1{\cdot}33 \times 10^{-6}$M, reversibly mitostatic at $6{\cdot}56 \times 10^{-7}$M and inactive below $3{\cdot}28 \times 10^{-7}$M.

129 Prévost, N.
Action de la température sur les effets mitoclasique et tuméfiant de la colchicine. (**The action of temperature on the mitoclastic and tumour-inducing effects of colchicine**).
Rev. gén. Bot. 1958 : **65** : 458–70.
Experiments are described in which radicles of

*Allium cepa* were treated with colchicine at temperatures between 1 and 30° C. The action of the colchicine increased markedly with temperature; to obtain stathmocineses at 1° C., the concentration of colchicine needed to be twice that required for a similar effect at 20° C. At 20° C., stathmocineses and the formation of tumours occurred simultaneously; at lower temperatures c mitoses occurred more rapidly than the formation of tumours; the latter however was more marked at temperatures above 20° C.

130 McManus, A. A. & Dwyer, J. D.
**Certain mitotic effects in the root tip of onion following application of gibberellic acid and kinetin. (B).**
Plant Physiol. 1958 : **33** : Suppl. p.xv. (Abst.)

"Growing roots of onion were treated with gibberellic acid in concentrations of 1, 10, and 100 ppm and with kinetin in concentrations of 1 and 10 ppm. In serial longitudinal sections of the root tips, counts of mitotic figures were made to determine the effect of these substances on mitosis in root cells, and the mitotic figures were studied for production of mitotic aberrations."

131 Deysson, G. & Truhaut, R.
Influence de la glucosidation sur l'activité radiomimétique: comparaison de l'hydroquinone et de son glucoside, l'arbutoside.
**(Influence of glucosidation on radiomimetic activity: comparison of hydroquinone and its glucoside, arbutoside).**
CR Soc. Biol., Paris 1958 : **151** : 1719–22.

The radiomimetic activity of arbutoside upon onion root-tip mitosis was similar in type to that of hydroquinone but about four times less intense.

132 Hughes, C. & Spragg, S. P.
**The inhibition of mitosis by the reaction of maleic hydrazide with sulphydryl groups.**
Biochem. J. 1958 : **70** : 205–12.

The results of experiments in which pea seeds were treated with maleic hydrazide indicated that this compound reacts with protein SH groups and thus inhibits the reduction of protein S · S bonds by reduced glutathione during mitosis. Some speculations are also made on the possible mechanism by which maleic hydrazide may bring about chromosome aberrations.

133 Davidson, D.
**The effect of heat shocks on cell division.**
Chromosoma 1958 : **9** : 216–28.

Cut shoots of *Tradescantia paludosa* and *T. brevicaulis* were kept at 40° C. in a dark chamber for periods varying between one and three hours. This treatment did not affect more than three of the six anthers in a bud and it was thought that sensitivity to heat treatment is limited to a particular period in cell development. In some of the affected anthers, high frequencies of abnormal pollen mother cells occurred.
Both species had irregularities, which arose from centromere disturbances; lagging chromosomes and micronuclei were observed.
*T. paludosa* was more sensitive to a 3 hr. shock than *T. brevicaulis*; in the former, chromosome separation was completely suppressed. After shocks lasting one or one and a half hours, a multinucleate condition at telophase I was found in *T. paludosa* but not in *T. brevicaulis*. This condition must have resulted from failure to organize a bipolar spindle, chromosome separation being unaffected. It was concluded that the mechanism which controls anaphase has several components and these differ in their sensitivity to heat. Since these components may be inhibited independently of one another, they must also be capable of acting independently. In general, abnormalities were most frequent in the first meiotic division in *T. paludosa* and in the second in *T. brevicaulis*. It is suggested that differences in sensitivity and type of abnormality between these species may be of importance in determining their survival and reproduction under conditions of high temperature.

134 Östergren, G., Morris, R. & Wakonig, T.
**A study in *Hyacinthus* on chromosome size and breakability by X-rays.**
Hereditas, Lund 1958 : **44** : 1–17.

A considerably higher frequency of chromosome fragmentation per cell was induced in *H. orientalis* ($2n = 16$) than in *H. dalmaticus* (*Bellevalia dalmatica*) with $2n = 20$. The former species has much larger chromosomes than the latter.

135 Kirby-Smith, J. S. & Dolphin, G. W.
**Chromosome breakage at high radiation dose-rates.**
Nature, Lond. 1958 : **182** : 270–71.

An exploratory investigation of chromosomal breakage in *Tradescantia* microspores has been carried out at dose rates up to $4 \times 10^8$ rads/sec.,

using the electron and X-ray beams from the 15-MeV linear accelerator at St. Bartholomew's Hospital, London. A significant decrease in the frequency of aberrations at dose rates of more than 10 rads/sec. has been obtained for material irradiated in air. This decrease has been observed repeatedly for deletions as well as for exchange aberrations. The curve given for treatments in air shows that the frequency of exchange aberrations has a constant value over a range of medium dose rates and falls off at both high and low dose rates. With irradiation in nitrogen, neither the frequency of deletions nor of exchange aberrations decreased at high dose rates. At present no satisfactory explanation of the drop (40–50%) observed at high dose rates from the plateaux at medium dose rates can be offered, although processes involving recombination of secondary organic free radicals appear qualitatively plausible. An alternative explanation based on partial temporary anoxia resulting from immediate consumption of oxygen under intense bursts of radiation also requires consideration. A preliminary experiment carried out under increased oxygen tension suggests that the second explanation may be correct.

136 Wolff, S., Atwood, K. C., Randolph, M. L. & Luippold, H. E.
**Factors limiting the number of radiation-induced chromosome exchanges. 1. Distance: Evidence from non-interaction of x-ray- and neutron-induced breaks.**
J. biophys. biochem. Cyt. 1958 : **4** : 365–72.

"Soaked seeds of *Vicia faba* were exposed to fractionated doses of x-rays or x-rays and fast neutrons. When the two-hit (exchange) chromosome aberrations were scored at the first mitosis of the root tip, it was observed that with short fractionation times the radiation-induced breaks from the two x-ray doses could rejoin with one another to form exchanges in proportion to the square of the total dose. If, however, one dose was x-rays and the second neutrons, then no quantitatively determinable interaction occurred between the breaks induced by each fraction.

"The phenomenon of non-interaction as observed by these dose fractionation studies and also by the linear dose response curve for two-break aberrations induced by neutrons has led to calculations of the distance over which two breaks can rejoin. The distance is evidently much smaller than the previously accepted value of 1$\mu$." [Authors' summary].

137 Gori, C.
Osservazioni preliminari sull'azione citologica di alcune furocumarine dell'essenza di bergamotto). (**Preliminary observations on the cytological action of some furane coumarins from oil of bergamot**).
Caryologia 1958 : **11** : 68–71.

Solutions of oil of bergamot tested on *Allium cepa* produced chromosome fragmentation, translocation and associated aberrations but no c-mitosis or stickiness. The constituent of the oil responsible for its mutagenic activity is thought to be bergaptene.

138 Moutschen-Dahmen, J. & Moutschen-Dahmen, M.
Sur l'évolution des lésions causées par la 8-ethoxycaféine chez *Hordeum sativum* et chez *Vicia faba*. (**On the development of the lesions caused by 8-ethoxycaffeine in *H. sativum* and *V. faba***).
Hereditas, Lund 1958 : **44** : 18–36.

Dry and presoaked seeds of *H. sativum* and *V. faba* were treated with 0·15% 8-ethoxycaffeine and mitosis in the root tips was studied from 35 to 350 hr. after treatment. The primary effects in *Hordeum* were erosion of the chromosomes and clumping at metaphase and stickiness, sticky bridges and fragmentation at anaphase; in *Vicia* only fragments were observed. The frequency of breaks in *Vicia* was much higher than that in *Hordeum* throughout the period of observation. Many of the breaks in *Hordeum* were localized at the centromeres, the secondary constrictions of chromosomes 6 and 7 and the tertiary constrictions of chromosomes 1 and 7. In *Vicia*, a high percentage of the breaks also occurred at the centromeres and at the nucleolar constrictions. The number of breaks decreased progressively in *Hordeum* after treatment, none being observed after 250 hr.; in *Vicia* the number of breaks increased as the roots developed. Polyradial configurations were seen in *Vicia* and these resulted in secondary breaks and the formation of polysatellitic chromosomes. The secondary breaks are thought to have taken place at the junction between a satellite and the nucleolar constriction. Schemes are outlined which show the probable development of the polyradial configurations.

139 Fröst, S.
**Studies of the genetical effects of accessory chromosomes in *Centaurea scabiosa*.**
Hereditas, Lund 1958 : **44** : 112–22.

Numbers of accessory chromosomes above six

had an adverse effect on vegetative development and pollen fertility in *C. scabiosa*. The various numbers of accessories had no significant influence on rate of germination.

140 Mortimer, R. K.
**Radiobiological and genetic studies on a polyploid series (haploid to hexaploid) of *Saccharomyces cerevisiae*.**
Radiation Res. 1958 : **9** : 312–26.

"A related series of *Saccharomyces cerevisiae* varying in ploidy from haploid to hexaploid was developed by a series of controlled matings.
"The radiation studies on the different cultures showed an increase in resistance to X-ray inactivation from haploid to diploid, followed by a progressive decrease in radioresistance with further increases in ploidy from diploid through hexaploid. Considerable variability of radiation resistance of diploid cultures was encountered, and the results suggested that this may be at least in part due to variations in degree of genetic homozygosity.
"The results of the radiation studies are consistent with the assumption that the majority of inactivation of haploid cultures is brought about by recessive lethals, whereas higher-ploidy cultures are inactivated mostly by dominant lethals."
[From author's summary].

141 Parrish, M. J.
**A cytogenetic comparison of the floras of southeast Asia and the southeastern United States.**
Diss. Abstr. 1957 : **17** : Publ. No. 24,241 : 2774–75. (Abst.).

The results of an analysis of the cytology, distribution and extent of speciation of 133 genera represented in both the above regions are summarized. Suggestions are made as to the evolutionary factors responsible for the main features found. With respect to variability in chromosome number, it is stated that the frequency of polyploidy and aneuploidy tends to be higher in the Asiatic species. Polyploidy in Asiatic species is associated with the occurrence of this condition among the American species of a genus.

142 Sokolovskaja, A. P.
**(On the correlation between the number of chromosomes and the size of pollen grains in the arctic species of Ranunculaceae and Saxifragaceae).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1146–55. [Russian].

Data presented on chromosome number, pollen morphology and dimensions show that in a large number of species there was a correlation between pollen size and degree of ploidy.

143 Reese, G.
Polyploidie und Verbreitung. **(Polyploidy and distribution).**
Z. Bot. 1958 : **46** : 339–54.

From a survey of the literature, the author concludes that, although the percentage of polyploid species increases with latitude in the northern hemisphere, this should be attributed not to the selection of polyploids in increasingly extreme climates but to the greater variability of the polyploids and hence their greater ability to colonize areas made available by the retreat of ice in postglacial times. Other work is quoted to show that floras in extreme climates do not necessarily contain exceptionally high proportions of polyploids while relatively high percentages are found in newly colonized areas. It is concluded that, in general, the younger a flora, the higher its proportion of polyploids.

144 Rieger, R.
Die Meioseverhalten von Gonotokonten mit abnormen Chromosomenzahlen bei *Antirrhinum majus* L. I. Mehrkernige Pollenmutterzellen bei haploiden Formen. **(The meiotic behaviour of gonotokonts with abnormal chromosome numbers in *A. majus* L. I. Multinucleate pollen mother cells in haploid forms).**
Biol. Zbl. 1958 : **77** : 237–44.

Among pollen mother cells in haploid plants of *A. majus* ($n = 8$), many were diploids and uninucleate and a few had two haploid nuclei. In the latter type, one genome generally degenerated to form a pycnotic mass, while the other underwent abnormal division with many univalents. The different behaviour of the two nuclei is ascribed to cytoplasmic gradients.

145 Ferguson, J. H. A.
**Empirical estimation of thermoreaction curves for the rate of development.**
Euphytica, Wageningen 1958 : **7** : 140–46.

The author gives a method of calculating a linear or curvilinear relationship between the temperature and rate of development during a given growth phase. The term thermoreaction is defined as the "contribution during one hour in a certain phase of development of a plant, as attributed to the air-temperature during that hour by a regression function. The total development in the phase considered is the unit

in which the estimated hourly thermoreactions are to be expressed and therefore by definition the sum of the estimated thermoreactions, which together build up the development considered, is expected to be unity." The data required from each planting are the numbers of hours during which each temperature has prevailed during the developmental period under consideration. These temperature frequency distributions may be read from thermograph charts. Application of the method is exemplified by the construction of thermoreaction curves, for daylight hours only, for 14 varieties of garden pea with respect to the period from sowing to appearance of the first flower. The varieties fell into three types according to the curves.

146 SCHWEMMLE, J.
Der Samensatz bei Kreuzungen mit der Trisomen *Oenothera Berteriana* var. *angusta*. (**Seed set in crosses of trisomic *Oe. berteriana* var. *angusta***).
Biol. Zbl. 1957 : **77** : 153–62.

SCHWEMMLE, J.
Über Kreuzungen mit der trisomen *Oenothera odorata* var. *tenella*. (**On crosses of trisomic *Oe. odorata* var. *tenella***).
Ibid. 1958 : **77** : 328–47.

In both papers it is shown that ovules of different genotype show different frequencies of fertilization, and that the same is true of ovules of similar genotype when these occur in mother plants of differing genetic constitution, e.g. B ovules in B.$l_8$ and B.$l_t$ mother plants. In each case the frequencies are affected by the genotype of the pollen tube.

147 MÜNTZING, A.
**The balance between sexual and apomictic reproduction in some hybrids of *Potentilla*.**
Hereditas, Lund 1958 : **44** : 145–60.

The mode of reproduction of hybrids between sexual and apomictic strains of *P. argentea* has been found to be determined not only by the ratio of genomes from the sexual and apomictic parents but also by the action of specific genes.

148 NAKAJIMA, T.
**(Studies on embryo culture in plants. I. On the relation with auxin and the embryo factor).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 161–68. [Japanese].

Observations on the effects of malt extract, *Cucurbita* endosperm extract, indole-3-acetic acid, kinetin, 1,3-diphenylurea and casein hydrolysate on growth of *C. maxima* embryos *in vitro* are reported. The most marked promotion of embryonic growth resulted from the combined effect of 500 p.p.m. casein hydrolysate + 2·5 p.p.m. 1,3-diphenylurea.

## CROP PLANTS

149 DE HAAN, H.
**Old and new books dealing with general plant breeding.**
Euphytica, Wageningen 1958 : **7** : 197–221.

This survey of books dealing with general plant breeding covers a period of some sixty years. Bibliographical lists, comprising a total of 220 titles, are given for works published in 17 languages, with comments on points of particular interest.

**Report of the Rothamsted Experimental Station for 1957** (1958) : Pp. 316.

150 *Thorne, G. N. Varietal differences in barley.* (*pp. 88–89*).

It was found that although Plumage Archer barley produces more tillers than Proctor, a smaller proportion survives to form ears. When the two varieties were grown in pots without additional nitrogen fertilizer, half the first primary tillers survived in both varieties; most of the second primary tillers of Proctor also survived but none of Plumage Archer. In a similar experiment with a higher rate of nitrogen supply, the primary tillers survived in both varieties and 85% of the secondary tillers of Proctor survived but only 14% of those of Plumage Archer. It was suggested that the differences are due to a relaxation in apical dominance in Proctor; there was also a higher ear : shoot dry weight ratio at the time of ear emergence in Proctor. The higher grain yield of Proctor in field cultures has been shown to result from additional photosynthesis in the ears.

151 *Bawden, F. C. Plant pathology department.* (*pp. 104–23*).

Testing of inbred lines of sugar beet for resistance to yellows was continued. In a trial near Ipswich, where the disease was serious, the lines A73/1 and Q1S/1 outyielded Sharpes E and Battles E. Differences were found between five inbred lines from Dunholme in respect of the symptoms produced by water mottle virus, which is isolated from wild beet and appears to be related to beet mosaic virus.

The leaf axils of potato plants were inoculated with spore suspensions of *Phytophthora infestans* in the greenhouse; 30 inoculations to Up-to-Date, King Edward, Majestic and Arran Viking produced 13, 8, 1 and 0 stem lesions and 19, 20, 2 and 1 petiole infections respectively. Similar varietal differences were found in stem lesions occurring in the field and in the resistance of the tubers.

It is known that races of *Fusarium oxysporum* f. *pisi* react differently to root exudates from varieties of pea. Spores of race 1 cannot grow in exudate from the variety Alaska, which is resistant to that race, but race 2, to which Alaska is susceptible, is stimulated by the Alaska exudate. When spores of race 1 were kept for 14 days in concentrated solutions of Alaska root exudate, their virulence towards Alaska was increased and that towards Onward was decreased. It is suggested that these changes resulted from either a mechanism similar to enzymatic adaptation or selection of mutants of altered pathogenicity by the exudate.

Of the new pea varieties from New Zealand tested at Rayne, Blue Prussian had 28% plants wilted, Greenfeast 35% and Resistant Onward 46% whereas English Onward had 100 per cent. Greenhouse tests at Cambridge and Rothamsted gave similar results. [Cf. XXVIII, 4896].

Radish varieties were tested for susceptibility to several isolates of *Plasmodiophora brassicae*. Red Forcing was highly resistant to all the isolates. The experiment was unsuccessful as regards finding differential hosts for strains of *P. brassicae*.

152 *Jones, F. G. W. Nematology department.* (*pp. 124–30*).

Of twenty-five populations of potato-root eelworm tested, only eight were nonaggressive to crosses between *Solanum tuberosum* sspp. *tuberosum* and *andigenum*; *S. vernei* was resistant to all these populations and to twelve others. A large collection of oat species and varieties were tested for resistance to *Heterodera major* and thirty-five plants developed very few or no cysts.

**Report of the Welsh Plant Breeding Station, University College of Wales, Aberystwyth 1950–1956** (1958) : Pp. 171.

153 *Beddows, A. R. Grass breeding.* (*pp. 11–35*).

The cytological investigations are described in more detail in the report of the Cytology Section [cf. 157] and are in the main not referred to in this abstract.

***Dactylis.*** An early-headed strain of cocksfoot expected to give fresh-growing herbage earlier in the spring than American or Danish has been developed. It has erect habit and good aftermath growth.

Material consisting chiefly of *Dactylis* spp. from countries of the Mediterranean region has already proved to be of considerable interest in genecological investigations. It is hoped that it will be possible to select from the introductions plants to form the basis of new strains differing in special features from those already in use.

***Agrostis.*** A strain of *A. tenuis* has been developed which may be especially useful in the less fertile marginal areas.

**Timothy.** A hay type is being developed which is taller, more erect, darker green and earlier in heading than A51.

Testing the self compatibility of plants from various populations continued. Of the hexaploids tested, 25 were self compatible, 11 of these giving abnormal as well as normal green seedlings.

***Lolium.*** Two strains of perennial ryegrass have been produced: (1) a late-flowering type intended for late-autumn or early-winter grazing, and (2) a green foggage type flowering in mid-season and intended primarily for grazing in late winter or very early spring.

In perennial ryegrass, a study is being made of the effects of using different numbers of parent plants in relation to vigour and variability in successive generations of strains.

The evaluation of perennial-ryegrass strains and New Zealand Short Rotation ryegrass on the basis of sown drills and broadcast plots tended to be similar to that based on single spaced plants.

Reciprocal differences in germination percentage, seedling leaf length and plant size have been noted in crosses of *L. italicum* 'S22' with the early-flowering strain S24 and late-flowering strain S101 of *L. perenne*.

Further selection for seven successive generations of repeated intercrosses for earlier heading in the late-flowering strain S23 of *L. perenne* resulted in families which in some cases were nearly three weeks earlier in mean date of ear emergence than those of the first generation. The effect of earlier heading on growth form was, however, relatively slight. Although the plants were somewhat laxer and had slightly taller inflorescences, total number of inflorescences and green weight showed no consistent change. This result is of considerable practical importance since, although it indicated the possibility of a shift in date of inflorescence production after several generations of seed

multiplication, the characteristic of high degree of tillering, i.e. persistency, was not seriously changed.

A survey of samples of *L. perenne* grown from seed of different geographical origin has been carried out by selfing and crossing with tester plants, each heterozygous for *d* (dwarfness), *y* (yellow-tipped albino) and *r* (one of the complementary genes controlling anthocyanin pigmentation). Each population carried a range of recessive mutations in the heterozygous state.

Viable seed was secured from *L. italicum* x *Festuca arundinacea* and the reciprocal.

Other investigations included a study of meteorological conditions in relation to anthesis in *L. perenne* and *L. italicum.*

***Arrhenatherum.*** A form of *A. elatius* has has been selected which is still in the leafy stage when plants of the ordinary hay type have developed inflorescences.

***Phalaris.*** Hybrids from *Ph. arundinacea* x *Ph. tuberosa* were selected with a view to developing a strain.

***Anthoxanthum.*** A new strain of *A. odoratum* may be particularly useful in the less fertile marginal areas.

***Alopecurus.*** Breeding of *A. pratensis* is receiving attention. The chief use of this species may be the provision of herbage during the midsummer gap rather than the production of early-spring keep which is generally regarded as its chief merit.

***Holcus.*** $F_1$ plants from *H. lanatus* x *H. mollis* were ♂ sterile with nondehiscent anthers; attempts to back cross them were unsuccessful. The $F_1$ plants ranged in $2n$ number from 21 to 42. Examination of the parents confirmed that *H. lanatus* had $2n = 14$ but revealed that *H. mollis* from various localities consisted of a polyploid series ($2n = 28$, 35, 42 and 49).

Some evidence was obtained suggesting that self fertility in *H. mollis* improves with increase in chromosome number. The ♀ fertility of all the chromosome races was similar when the plants were allowed to interpollinate but much lower than in *H. lanatus.*

The cross compatibility of the different races of *H. mollis* with one another and with *H. lanatus* was determined.

Attempts to hybridize *Arrhenatherum elatius* ($2n = 28$) with *H. lanatus* and *H. mollis* ($2n = 28$ and 42) failed.

154 *Cooper, J. P. Plant genetics (grasses). (pp. 36–50).*

The main project in this section is the study of genetic and physiological differences causing variation in field performance. Most attention has been given to the timing and extent of inflorescence development. In 1955, investigations were also initiated on rate of tiller production in the seedling stage, its genetic and environmental control, and its relation to seasonal productivity. The work has involved two stages: (1) establishment of standard field and greenhouse techniques for measuring developmental responses, and the application of these techniques to detect differences between species and strains, and (2) an investigation of the genetic structure of populations, special attention being paid to the balance between free and potential variation and the rate at which potential variation is released for selection. Most of the work has already been reported in several papers, summarized in *Plant Breeding Abstracts.* It has been carried out chiefly on *Lolium* spp.

In addition, a report is given of investigations on the following single-gene characters in *Lolium*, of value both in the study of developmental effects of individual alleles instead of polygenic systems and also as genetic markers in population analysis. (1) In a recessive dwarf type, the rate of elongation of the leaf blade and sheath is severely reduced [cf. 414]. (2) A recessive type with broader and shorter leaves than normal and with prominent ribbing on the upper surface has been discovered in *L. perenne.* Its inflorescence is somewhat compressed and very rigid. This type cannot be converted into the normal phenotype by gibberellic acid. (3) A "shaving-brush" type found in the selfed progeny of a plant of *L. perenne* from old pasture in Leicestershire has narrower and paler green leaves than normal and a very tufted habit. (4) The dominant character of roughness of stem occurs in most plants of annual Wimmera ryegrass and occasionally in Irish, Devon, Eaver and Kent. (5) The recessive feature of brittle rachis has occasionally been observed in Wimmera ryegrass. (6) In Irish perennial ryegrass, a recessive gene has been detected which is responsible for the formation of an oblique ligule on the flag leaf, with no visible boundary between blade and sheath on the underside of the leaf. (7) Another recessive allele in *L. perenne* determines a "pallid" appearance, causing a pale leaden-green colour from the fourth-leaf stage onwards, accompanied by loss of vigour.

155 *Davies, W. E. Legume breeding. (pp. 51–65).*

**Lucerne.** With a view to obtaining information

relevant to the evaluation of breeding material, four strains were compared as single plants and in drills, broadcast sowings, drills + a companion grass and when broadcast + a companion grass. The interaction strain x treatment was significant. Single-plant behaviour did not necessarily correspond with performance in broadcast plots.

Selections involving Grimm and Hungarian White Seal in their origin are undergoing field test. Crosses have been made between Du Puits and Rhizoma to develop a more vigorous strain with a longer growing season. Selections have also been made within Flamande and Poitou.

The possible value of polyploids is being explored.

Work on hybridization between *Medicago* spp. has been initiated. Study of the inheritance of flower colour and other mutant characters is under way.

**Clovers.** One of the chief aims of white-clover breeding is the development of a strain from Ladino x S100 with larger leaves and longer petioles than S100, capable of competing successfully with grass. The release of S100 Nomark, distinguishable from other strains by the complete absence of leaf marking, has been authorized [cf. XXVIII, 3094].

The geographical distribution of the genes *Li* and *Ac* concerned with the production of HCN in white clover has been investigated by Daday [cf. XXVIII, 4341].

Data have been obtained confirming the conclusion of Brewbaker and others that leaf marking in white clover is conditioned by a series of alleles, absence of marking being recessive. "The marker alleles form a mosaic-dominance pattern, and the heterozygotes can be identified if the positions on the leaf are not identical". A similar independent allelic system has been suggested in the case of anthocyanin leaf markings but this has not yet been corroborated.

A Nomark strain has been developed from reselections of the red clover S123. The breeding of a type of late-flowering red clover in which the tillers are upright instead of prostrate is under way.

Many polyploid families of red clover have outyielded the diploid controls in single-plant tests. It is hoped that the defects of low seed setting and greater susceptibility to drought shown by the polyploids may be lessened by selection. Only a few of the 64-chromosome families of white clover have given increase in yield as single plants over the control S100.

Interspecific relationships in *Trifolium* have been investigated, the techniques of grafting, emasculation and embryo culture being used in the attempt to produce hybrids. Success in interspecific grafting has corresponded with success in interspecific hybridization [cf. XXV, 3135]. Hybrids have been secured from *T. repens* x *T. nigrescens*, *T. repens* x *T. uniflorum*, and *T. hybridum* x *T. ambiguum*. Chromosome morphology has also been investigated with a view to elucidating interspecific relationships. The length of the chromosome among the species studied varied from 1 to 4 $\mu$. Even within *T. repens* considerable variation in length was noted, the largest chromosomes being found in var. *giganteum*. A pair of chromosomes with satellites was observed in *T. pratense*, *T. incarnatum*, *T. alexandrinum* and *T. repens*. *T. hybridum* has no satellites, and two pairs of small chromosomes as against four such pairs in *T. repens*. On the basis of chromosome morphology alone it was difficult to trace interspecific relationships.

The development of an early-flowering red clover resistant to *Sclerotinia trifoliorum* is in progress. A technique for the inoculation of seedlings at the age of 3 weeks with mycelia in bran has been used in making initial selections. Survival rate was of the order of one in 1500. A further test was carried out at the mature-plant stage on clones derived from resistant seedlings. After testing $F_1$ families from a diallel cross of the most resistant material, interfamily and intrafamily crosses were made of plants from families having six particularly good parents in respect of resistance. The $F_2$ has shown significantly more resistance than the unselected controls. Seedlings from a third generation of selected plants have been established for field testing. Preliminary observations on wild material from the western European Mediterranean area suggest that it may be of value as a source of genes for resistance [cf. XXV, 2743]. Investigations have also been carried out on variation of the pathogen. As reported earlier, no evidence has been obtained of physiological specialization but the formation of heterocaryons may give rise to new biotypes [cf. XXV, 2740]. From the results of coinoculation with single-ascospore lines within and between asci, it was concluded that at least three genes in the pathogen determine "reaction" type. The four genotypes from a single ascus frequently differed in growth rate and pathogenicity, an inverse relationship between the two characters being noted. Ascospore size, presence or absence of sclerotia and time of formation and relative abundance

of either microconidia or sclerotia were all controlled by a single gene.

156 *Griffiths, D. J. Cereal, bean and* Brassicae *breeding. (pp. 66–93).*

**Spring wheat.** Segregates of Jubilegem x Red Fife, Holdfast x Rival, Bersée x Rival and Jubilegem x Rival have been studied. A selection from the first cross is especially promising in respect of earliness of maturity, yield and standing ability.

**Oats.** The report opens with a review of the aims and results of earlier work, of which breeding during the period 1950–56 has formed a continuation.

Work on winter oats during the period referred to has included the following. The variety Powys (S172 x S147) was released [cf. XXVII, 448]. It partly fulfils the need for a third winter oat intermediate between the very short-strawed variety S172 requiring highly fertile conditions and S147 which is a longer-strawed, general-purpose type. Selections V907 and V1022 from S147 x sel. 0379 have shown further substantial improvements in yielding ability over all established varieties in trials during 1951–56. They have equalled S147 in hardiness and lodging resistance while possessing a better grain : straw ratio. V907 is fairly early in maturing and has grain of good quality; V1022 is somewhat later ripening and slightly inferior in quality. Although superior in several respects, selections from S147 x Milford have in most cases been inferior to derivatives of S172 x S147 in winter hardiness. Among the progenies of crosses between S147 and certain spring parents, a small proportion of the lines were superior in hardiness even over their winter parent during two severe seasons. The most hardy types were a number of mildew-resistant selections from S147 x the mildew-resistant spring oat 01747/10/7. Progenies derived from crosses involving the stem-eelworm resistant varieties Grey Winter, S81, Picton, S172 and Milford (S225) and susceptible oats, chiefly S147, were selected for resistance to this pest and agronomic characters. Promising lines with respect to yield, hardiness, mildew resistance and grain quality and colour have been crossed with eelworm-resistant types with a view to combining the two types of resistance in a single variety.

Breeding spring oats for different levels of fertility continued, chiefly for average and above-average conditions of fertility. In tests of oats under upland conditions, a selection of Englebrekt x 464/24/2 (Radnorshire Sprig x Victory) and a black-grained selection from S221 x S220 back-cross material showed improvements over S220. As a possible variety for soils of high productivity, D1670 (S84 x Eagle) is of especial interest. It has short plump grain and straw slightly shorter and stiffer than that of Sun II. It ripens about 2-4 days later and has compared favourably with Sun II in grain yield in extensive trials. Progress has been made in developing desirable agronomic types, resistant to both crown rust and mildew, from 01750/11 x Tama, and stiff-strawed and mildew-resistant selections from Milford x 01747/10/7. In addition to the unnamed selections in the two last-mentioned crosses, an unidentified hexaploid (Cc4146), believed to be a natural hybrid of *Avena sativa* x *A. ludoviciana*, has also been used as a source of mildew resistance, but on account of the undesirable features of its grain, progress has been slow. Resistant white-grained selections from the $F_4$ of CC4146 x Sun II have been used in further crossing and in back crossing. No new races of mildew have occurred, but the appearance of two new races (274 and 275) of crown rust has complicated breeding. Greenhouse tests showed that selections possessing the Bond type of resistance were susceptible to both races, while those derived from Tama and Victoria were moderately susceptible to race 274 but resistant to race 275. Landhafer and Santa Fe proved resistant to all 13 races identified so far. Landhafer has been used as a resistant parent. In breeding for resistance to stem eelworm, reliance is being placed on Milford as this is the only adapted spring variety which has shown resistance. In field tests of resistance to *Heterodera major*, only *A. abyssinica* has had cyst-free roots.

Trials were carried out on mixtures of varieties *vs.* pure stands. In all tests the mixtures of two varieties equalled or produced more than the component giving the higher yield when grown separately. A consistent shift occurred from year to year in the proportions of the varieties, but the higher-yielding component did not always become the dominant variety in the mixture. This result is of significance in relation to the likelihood of recovering lines superior in yield from hybrid progenies which have been continued without selection on a population basis for several generations.

Sterile dwarf plants appearing among the progenies of some selections of *A. sativa* x *A. byzantina* had $8n = 40$. The unstable normal plants segregating into dwarfs and normals had $2n = 42$ and were unexpectedly regular in meiosis. At the stage of reduced mitotic

activity before dormancy of the seed, extrusion of chromosomes from the nucleus was observed. The breeding behaviour of the unstable plants through several generations of selfing and when crossed with stable lines indicated that this abnormality, giving rise to nullisomics, is subject to genetic control.

Work on interspecific relationships and artificial polyploidy was initiated in 1951. Hybrids between diploids were fully fertile, except for those involving *A. longiglumis*. The high degree of sterility of the latter hybrids is attributed to multivalent formation. Tetraploids from colchicine-doubled *A. strigosa* ssp. *hirtula* x *A. longiglumis* had a fertility approaching 50%. A structural interchange was noted during meiosis in all hybrids between the tetraploid species *A. abyssinica*, *A. barbata* and *A. vaviloviana*, but it is not yet clear whether the chromosomes involved are the same in all the crosses. The cross "autotetraploid S171" x *A. abyssinica* was studied in detail. All $F_3$ progenies gave extremely low seed sets and in consequence offer little scope for developing satisfactory 4*x* forms for conditions in Great Britain. Hexaploids of *A. barbata* x *A. hirtula*, *A. barbata* x *A. longiglumis* and *A. abyssinica* x *A. brevis* have been synthesized with the aid of the colchicine technique. Meiotic behaviour in the $F_2$ triploid of *A. barbata* x *A. hirtula* was indicative of a close affinity between one genome of the former species and the genome of the latter. Hybrids between the synthetic hexaploid of *A. barbata* x *A. hirtula* and natural hexaploid species were only obtained when a natural species was used as ♂ parent. Bivalent pairing was very much lower in frequency in the hybrids than in the natural parental species. The essential similarity between pairing in the hybrids provided further evidence of the close affinity between the 6*x* species. All the hybrids have shown complete sterility, but it is doubtful whether high number of univalents is entirely responsible.

Apart from albino seedlings, no obvious morphological variants were observed in the $X_2$ of S147 and S172. The search for agronomically useful mutants is continuing. Sterile and fertile fatuoids were induced in *A. sterilis* var. *maxima* by X irradiation. The fertile fatuoids closely resembled *A. fatua*. *A. fatua* may therefore have arisen through mutation of *A. sterilis*, as suggested by Coffman.

**Spring barley.** Selections 23Co3/5/22 and 2302/22 from Plumage Archer x Hen Gymro and 29Co5/28 (Balder x Hen Gymro) represent an improvement over the land variety Hen Gymro in yield, stiffness of straw and earlier ripening.

**Forage kales and rapes.** Breeding of these crops was initiated in 1955.

Canson Kale, a dwarf thousand-headed type, has shown considerable promise because of its very leafy, low-growing habit, winter hardiness and lateness of flowering in spring. Plants of this variety have been selected in order to explore the possibility of exploiting hybrid vigour by crossing inbreds.

Progress has been made in developing techniques for handling, under greenhouse conditions, plants selected from the field for breeding.

**Field broad bean.** Evidence has been obtained that the breeding system in *Vicia faba* is adapted to a fairly high degree of hybridity. In spite of the theoretical possibilities of exploiting hybrid vigour, the practical difficulties involved in such an approach in breeding have necessitated an investigation of the value of self-fertile lines. A long-term analysis of the effects of inbreeding has been initiated and the possibility of isolating vigorous self-fertile, self-tripping lines from existing populations has been envisaged. Differences have been found between plants in self compatibility.

Selection for type in winter and spring beans is continuing on a population basis. Several stocks of winter beans have exhibited an outstandingly high degree of winter hardiness.

157 *Jones, K. Cytology section.* (*pp. 156–60*).

***Dactylis.*** A cytological survey has been made of a wide range of ecotypes of species from Europe and the southern Mediterranean area. Diploids have been identified in FAO collections from Portugal and Algeria. The remaining lots are tetraploids ($2n = \pm 28$), with 3·7% of aneuploids ($2n = 27, 29, 31$). B chromosomes ranging in number from 1 to 4 have been found in Portuguese material and some tetraploids from Cyprus and Algeria. Pairing in the diploids is of the expected type, with $7_{II}$ at metaphase I. Two plants from different sources were considered to be interchange heterozygotes. $F_1$ hybrids between the Mediterranean and Portuguese diploids and *D. aschersoniana* and *D. voronovii* showed completely regular pairing. Pairing in 64 tetraploids from 10 different regions was consistently of the autotetraploid type, with an overall mean of $2{\cdot}97_{IV}$ per cell; 10·9% of the plants showed multivalents of a higher order and were classed as interchange heterozygotes. Analysis of 35 plants representing 4 commercial and pedigree strains gave a mean of $3{\cdot}04_{IV}$ per cell; no interchange

heterozygotes were detected. Thirty-seven plants from the $F_1$ of six crosses between tetraploid ecotypes showed a slight but uniform reduction in quadrivalent means, with an overall mean of 2·49, evidence of a low degree of chromosome differentiation thus being offered. Interchange heterozygotes accounted for 2·7% of the plants.

Triploids from *D. glomerata* x *D. voronovii* and *D. glomerata* x *D. aschersoniana* had mean frequencies of $3{\cdot}36_{III}$ and $4{\cdot}01_{III}$ per cell, respectively. The data on these and other triploids indicate that small differences between the chromosomes of diploids can be more readily detected by pairing behaviour in triploid combinations.

Physiological aging of seeds of *D. glomerata* causes chromosome breakage and reunion in the seedlings. An experiment has been initiated to study this type of aberration in seeds 1–12 years in age, which have not been stored under conditions designed to retain germinative capacity.

***Agrostis.*** The cytology of British species and their hybrids has been studied [cf. XXVII, 1863–65].

***Lolium.*** Interchanges have been studied in *L. perenne,* using three unrelated plants, each heterozygous for an interchange which showed itself as a quadrivalent at meiosis. The plants were crossed in the combinations A x B, C x B and C x A. $F_1$ data indicated that A and B are heterozygous for interchanges involving the same chromosomes but that the interchange in C is distinct. The proportion of homozygotes to heterozygotes accorded with expectation except in C x B, in which strong selection for interchange heterozygotes was expressed, particularly for the double heterozygote. The behaviour of C x B must be the result of interaction of the genic complexes of the two parents.

***Anthoxanthum.*** Plants of *A. odoratum* ($2n = 20$) from different localities showed autotetraploid behaviour, with mean frequencies of $2–3_{IV}$ per cell. Every plant had at least one association of 6 or 8 chromosomes at metaphase I. This species is therefore characterized by intense selection for interchange heterozygosity. According to preliminary observations, the nucleolar chromosomes are usually involved in the interchanges, which may have arisen as the result of the fragile nature of the secondary constrictions.

The origin of *A. odoratum* is being investigated by study of (1) the comparative morphology of the chromosomes of this species and the diploids *A. alpinum* and *A. puelii* and (2) triploids from *A. odoratum* x *A. puelii.* No evidence has so far been obtained in support of the hypothesis that *A. alpinum* is the diploid progenitor of *A. odoratum.*

***Holcus.*** [Cf. 425].

158 *Brief descriptive note on the new winter oat variety Powys (S.226) (pp. 166)*

[Cf. XXVII, 448 and XXIX, 156].

159 *Brief descriptive note on S.100 "Nomark" white clover. (p. 167.)*

[Cf. XXVIII, 3094 and XXIX, 155].

160 Aus der Arbeit der Sektion Pflanzenbau, Pflanzenzüchtung und Pflanzenschutz. (**From the work of the Section for Plant Cultivation, Breeding and Protection**).
Dtsch. Landw. Berl. 1958 : **9** : p. 448.

A brief report is presented on a meeting held at the Research Station for Cereal Breeding in Kloster Hadmersleben during July 1958. Talks were given on the work of this institute. Vettel surveyed the methods used in breeding cereals and Schulz reported on work with winter and spring wheats, mention being made of primary aims in breeding. Lau spoke on the development of new spring barleys and oats. Plarre described the success obtained in rye improvement at Hadmersleben and also mentioned the breeding of *Lupinus albus.* Porsche dealt with work on *L. polyphyllus* and sweet sorghum.

161 Barbacki, S.
Nowe drogi do poznania dziedziczności. (**New trends in knowledge on heredity**).
Postępy Nauk Roln. 1956 : No. 1 : 3–15.

After a general discussion of evolution and a short analysis of the Mendel-Morgan theory of heredity, attention is drawn to the importance of biochemical research into the processes connected with heredity at different stages of plant growth. Lupins and other Papilionaceous plants and cereal crops are used as illustrations. A review is given of the author's work over many years on the inheritance of protein content in hybrids obtained by crossing Himalayan six-rowed barley with European two-rowed barley [cf. XVIII, 1591].

162 Žukovskij, P. M.
(**World resources of plants in the service of Soviet plant breeding**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 8–20 [Russian].

[Cf. XXVIII, 1417].

163 Marinič, P. E.
**(The varietal resources of socialist agriculture).**
Selekcija i Semenovodstovo (Breeding & Seed-growing) 1958 : No. 1 : 41–48. [Russian].

Some recent Soviet standard varieties of agricultural and industrial crop plants are listed. Among the new varieties a spring wheat, Caesium 94, from Omsk is mentioned for its good baking properties and the sugar beet Ramon' 023 for its high sugar content.

164 Malygin, Ju. N. & Pruckova, M. G.
**(Soviet-bred varieties at the Brussels Exhibition).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 62–65. [Russian].

Varieties of crop and industrial plants and vegetables exhibited at Brussels are listed and provided with brief descriptions. Among the cereals bred in recent years is the winter wheat Belaja Cerkov' 198, characterized by high yield, fine quality grain and resistance to Hessian fly and *Puccinia*. Others include the oat L'gov 26, notable for its productiveness, grain quality and lodging resistance, and a Georgian maize variety, Kartuli-Krugi, which yields 100 c. grain per ha. on irrigated land.

Among the forage plants are hardy clovers and lucernes, the drought resistant Sudan grass variety Krasnodar 1967 and the sweet lupins Nosovskij Belosemjannyj 6 [Nosovo White-seeded 6] and White Russian 6, both lupins being highly productive of seed and forage. The soya bean variety Primorskaja 529 is rich in oil and Amur 41 in protein. The vegetables include the beetroot Nesravnennaja A463 [Incomparable A463], with superior flavour, and the peas Moscow 572, Uladovo 5 and Uladovo 208 which combine a high protein content with good cookability and pleasant flavour.

Årsberättelse över Sveriges Utsädesförenings verksamhet år 1957. **(Annual report on the work of the Swedish Seed Association, 1957).**
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 99-194.

In addition to the work described below, mention is made of the numerous individual breeding lines of various crops which have done well at the different branch stations.

The possibilities of breeding for improved disease resistance in cereals has been receiving increased attention.

It is noted that material of clover, rye, turnip, beet and grasses has been subjected to chromosome doubling. Investigations on the production of allopolyploids in *Brassica* and *Trifolium*, between *Hordeum* and *Secale* and between *Lolium* and *Festuca* are also in progress.

**Mutagens.** Preliminary experiments have shown that 8-ethoxycaffeine gives predominantly chromosome aberrations and nebularin chiefly gene mutations. In both barley and *Vicia faba*, 8-ethoxycaffeine results in breakages in the heterochromatic sections of the satellite and centromere regions. A mutation frequency 2–3 times higher than that induced by the most effective X or neutron radiation may be produced in barley by ethyleneimine.

**Wheat.** Attempts to develop winter lines superior to Svale [XXVI, 116] from the same cross are in progress. Among spring wheat breeding material, the best lines come from the crosses (Sv01180 x Kärn II [Kernel II]) x Pondus, Sv48/660b x Pondus, Koga x Kärn II, 01180 x Kärn II, Sv01090 x Kärn II, Drott [King] x Kärn II, Diamant II [Diamond II] x Kärn II$^2$ and Fylgia II x Kärn II.

Rye-wheat crosses are being studied.

At Tornby, all the standard varieties were attacked by leafhoppers causing damage to the leaf sheaths, but a very early and hardy Russian variety and some lines from a cross between the latter and Odin were resistant.

**Oats.** A good series of varieties has been obtained from crosses between Sol II [Sun II] and Å33/79 (Perle [Pearl] x Stjärn [Star]) and other lines. At the Västernorrland branch station, Å01651 (Guldregn II [Golden Rain II] x Vidar), an early white oat, has done well over several years and is now being multiplied. A later variety, Å01680, is also being increased.

**Rye.** Work on the spring variety Sv0201 (Petkus x Od), two lines from spring x winter rye and a tetraploid spring rye is in progress. The last-mentioned is being released in California under the name Fourex, for use as a cover crop in vineyards.

Populations of tetraploid spring rye have been found to respond to stringent selection for regular meiosis and increased fertility.

**Barley.** High grain yields have been given by the new, very stiff-strawed two-rowed barleys Sv02148 (Sv30/19 x Balder), Sv02102 (Morgenrot [Dawn Red] x Ymer) and Sv02127 (Balder x Heimdal). The short-strawed, early X-ray mutant Sv04080 of Bonus has done well at several stations.

Among six-rowed barleys bred for earliness, Sv56/617 (Marockanskt [Moroccan] x Edda) and

lines from Primus x Asplund and Maja x Asplund have given good yields. Ög 03000, an early two-rowed variety from Maja x Drake, has also yielded well. In trials of winter barley, Sv50/17 (Peragis Mittelfrühe [Peragis Midearly] x Pommerskt Nordland [Pomeranian Nordland]) and a sister line outyielded the standard, Bore I. The X-ray mutants *erectoides* 32 (Sv04032) and Tidig 8 [Early 8], the former stiff-strawed and higher yielding and the latter earlier and stronger strawed than its parental variety Bonus, have continued to do well. A beginning has been made in obtaining material carrying duplications resulting from chromosome translocations.

At the Västernorrland branch station, most of the breeding material is two-rowed, deriving from crosses between the early, weak-strawed line Å38/230 (two-rowed Opal x six-rowed Vega) and late stiff-strawed varieties; several of the good characters of Vega have been transmitted to the new two-rowed lines. Transgressive segregation for straw strength has been found in several crosses involving Å38/230.

**Ryegrass.** Sv01408a [cf. XXVIII, 119] has continued to do well.

**Clover.** A number of diploid red clovers have exceeded Merkur in yield in second-year plots, but the highest yields were obtained from tetraploids, including Sv034 and W:s Rea. Selection for improved seed set has been effected in tetraploid lines. At the Västgöta station, tetraploid lines were markedly superior to diploids in yield and in resistance to *Sclerotinia trifoliorum*, the new tetraploid variety Ulva being particularly good. The latter variety also did well at Ultuna and has received the designation "original".

Ladino clover has been crossed with some white clover types.

Tetraploids of Alsike clover have generally proved superior to diploids in first-year plots.

**Lupin.** A crossing programme has begun, involving crosses among various early mutants and between these and early lines from the cross sweet yellow x bitter yellow lupin.

**Turnip.** Among induced tetraploid material is a population with high dry matter content; it should be useful in crossing with other tetraploids, which are usually poor in dry matter.

**Potato.** Among the newer clones, several withstood a period of drought at the height of summer better than standard varieties. At Kalmar, some seedlings have shown good blight resistance.

**Flax.** Wiera has been exceeded in straw and fibre by Sv54/1057 (from Margareta), which matures three days later, and has also been slightly surpassed in yield of fibre by Sv0261b, which equals Wiera in earliness.

**Oil crops.** Selection in the white mustard Primex has resulted in line Sv54/122 which has a higher oil content and gives higher yields of crude fat than the initial variety.

Lines of autumn turnip rape from Wilnesis x Lembkes have done well at the Kalmar and Östgöta branch stations.

**Pea.** The new variety U03521 gave the highest seed yield among cooking peas, while U05802 (Hero x Artturi) was the most productive of the fodder peas. A tendency has been observed at the Ultuna branch station for the new higher-yielding varieties to have a lower protein content.

The yellow pea U03521 (Ambrosia II x 03101), which is being multiplied, is as early as Torsdags III [Thursday III] but more productive.

166 Tuinbouwkundig onderzoek. Jaarverslag 1957. (**Horticultural research. Annual report, 1957**).
Directie van de Tuinbouw en het Tuinbouwonderwijs, 's-Gravenhage: 1957 : Pp. 327.

In addition to the details given below, this report on work at various stations in the Netherlands includes information on varietal trials of fruits and vegetables and notes on breeding of tobacco, winter rape, beet, radish and other vegetables and medicinal and culinary herbs.

***Capsicum.*** Crosses have been effected among some of the best red pepper varieties. Emasculation has to be carried out in the bud as the anthers normally ripen before the flower opens.

**Medicinal plants.** Tetraploid forms of *Datura stramonium* var. *inermis* contained $\pm$ 10% more alkaloid than diploids.

Seeds have been obtained from crosses of white and red diploids and red tetraploids of *Digitalis purpurea* with diploids of *D. lanata*. Tetraploids of *D. purpurea* and of *D. lanata* tend to be higher in glycoside content than corresponding diploids.

**Apple.** Seedlings from apple x pear crosses are being grown. In tests for resistance to *Phytophthora cactorum* and *Ph. syringae*, the apple rootstock M IX was very resistant, followed by M IV and the moderately resistant forms M VII and M XI; M XIII and M XVI were extremely susceptible. Among apples of the Cox's type, Cherry Cox's was fairly resistant to both pathogens. Laxton Fortune was susceptible to *Ph. syringae* but fairly resistant

to *Ph. cactorum*. Golden Delicious, Wealthy, Rode Boskoop [Red Boskoop], Winston and Reinette v. Zuccalmaglio were generally fairly resistant to both species, although the last variety was severely attacked by *Ph. syringae* in 1956. James Grieve was highly resistant.

**Red currant.** Flowers and fruits produced by mixoploid seedlings (2*n* and 4*n*) showed the morphological characters of diploids but have not yet been studied cytologically.

Treatment of further seedlings with colchicine has yielded some almost entirely tetraploid individuals. Large-berried varieties have been crossed with Stern des Nordens [Star of the North], which is resistant to rain damage. In selfing, fruit set was greater where flies had been introduced into the bags isolating the branches than where this was not done.

**Black currant.** Numerous crosses have been effected, the Canadian variety Consort, which is fairly resistant to night frost, being used as parent in many cases. Interspecific crosses have also been attempted.

**Strawberry.** Selection 668, which has performed well in trials since 1953, is being released under the name Oranda [XXVIII, 4691]. Another good selection, 667, expected to replace Climax, is being released under the name Juspa.

**Carrot.** Male sterility in carrot involves one or more dominant sterility genes as well as a cytoplasmic factor.

**Onion.** A male-sterile line of Primeur has been distributed to breeders for use in $F_1$ hybrid production.

**Leek.** Inbreeding depression occurs in the second and following inbred generations although not in the first. A few heterotic crosses have given some promising heavy individuals.

**Asparagus.** Homozygous male plants have been isolated and are to be used in crosses with high quality female plants.

***Brassica.*** Further evidence of the occurrence of several club-root races attacking different crops has been obtained [cf. XXVIII, 1270]. A Siberian curly kale proved to be the most resistant cabbage variety in North Holland but on a turnip plot in Gelderland it was the most susceptible. The cabbages Bindsachsener and Larson show a more general though less high resistance. The winter swede rape Lembke appears to be susceptible to all races.

In cabbage breeding, introduced varieties resistant to club root have been crossed and back crossed to susceptible parents. Low pH, very damp, heavily infected soil and a temperature of 24° C. gave the highest degree of infection in testing for resistance. The pointed-headed cabbage cross 3 x 4 has given promising offspring.

Crosses between summer cauliflowers susceptible to club root and resistant cabbages have been back crossed to cauliflower. It has been found that at 26° C. cauliflowers remain vegetative irrespective of day length and it is suggested that the fact that more leaves are formed during summer than during spring may be related to the higher temperatures obtaining in the summer.

Crosses between inbred lines of Brussels sprouts indicate that vigour is greater the greater the genetical dissimilarity between the lines. Some promising $F_1$ lines have been obtained. The percentage of selfing occurring in crosses between inbred lines was very low, indicating that inbreeding had not resulted in selection for self compatability.

**Lettuce.** In an attempt to develop varieties which yield heavier heads during winter production under glass, promising results have been obtained from crosses among Proeftuin's Blackpool [Test-plot Blackpool], Interrex, Kampioen [Champion] and Regina.

**Endive.** Netherlands varieties have been crossed with wild and cultivated forms with field resistance to *Alternaria porri* f. *dauci*.

**Melon.** The $F_1$ progenies of crosses involving Enkele Net [Single Net] as one parent resemble the latter in appearance while the $F_2$ progenies are very variable, particularly in fruit form.

**Cucumber.** Selections for resistance to *Cladosporium cucumerinum* has resulted in lines homozygous for resistance but otherwise resembling Groene Standard [Green Standard]. Some resistant varieties have been crossed with commercial varieties.

**Tomato.** Eelworm-resistant lines with large fruits have been selected. Selection for corky-root resistance continued in *Lycopersicon glandulosum*; resistance to the root-knot nematode also occurs in this species. Some $F_4$ lines of (Moneymaker x Earlinorth) x Moneymaker are promising in respect of earliness and fruit form. By means of embryo culture two hybrids of *L. esculentum* x *L. glandulosum* have been reared, one an aberrant form with potato-like leaves and the other an intermediate between the parental types. The hybrids have been vegetatively propagated. The $F_1$ of the rather late variety Moneymaker crossed with an early, low-growing type was earlier than Moneymaker but equalled it in yield.

***Phaseolus.*** *Ph. vulgaris* crossed with *Ph. dumosus* was tested for resistance to *Colletotrichum lindemuthianum* and the resistant plants

inoculated with *Pseudomonas phaseolicola* and several viruses; among the progeny of the surviving plants, 16% have proved totally free from *C. lindemuthianum*. In crosses of cultivars of *Ph. vulgaris* with various botanical forms, cross compatibility was very low. French bean has also been crossed with *Ph. coccineus*.

**Pea.** Seeds irradiated with slow neutrons at intensities of 5 x $10^8$Nth/cm.$^2$/sec. for $\frac{1}{2}$, 1 or 2 hr. have given rise to a number of chlorotic and fasciated plants. Irradiation for 4 or more hours was lethal.

167 Rapport sur l'activité de la Station de Recherches pour l'Amélioration des Plantes fruitières et maraîchères durant l'année 1957. (**Report on the activity of the Research Station for the Improvement of Fruit and Market Garden Crops during the year 1957**). Gembloux Pp. 140. (Mimeographed).

**Pome fruits.** A collection of important varieties of apple and pear are being studied with special reference to taste and appearance. The response of some apple varieties to various herbicides is noted.

**Raspberry.** A series of recent crosses is under observation. Morphological studies of a collection of varieties are also in progress, the aims being to produce a dichotomous key for identification purposes and to obtain information on promising breeding material.

***Ribes.*** Phenological observations were carried out on collections of red and black currants and gooseberries.

**Strawberry.** Hybridization is in progress, the aim being to produce replacements of varieties now suffering from degeneration; strawberries suitable for industrial purposes and in particular for rapid freezing are also being sought. From crosses made in 1952, using *Fragaria chiloensis* as a parent plant, vigorous and healthy lines producing large numbers of hermaphrodite flowers were obtained; these are to be used in further crosses. Studies are being made of possible correlations between seedling characters and other characters of cultural or economic importance apparent later in development. Talisman has done well and is expected to replace Auchincruive Climax. Plant characters are being studied with a view to obtaining exact descriptions of cultivated varieties; the cultural characters are also being investigated and it is hoped that the information will be of aid in selecting promising material for hybridization.

**Carrot.** A Danish variety, Nantes 39, was found to be an improvement on the original Nantes type; the roots are regular and the core of the carrot is reduced.

**Onion.** Lines and hybrids of keeping onions are being studied; notes are provided on three foreign lines.

***Brassica.*** Pedigree selection of cauliflower is in progress. A number of late savoy varieties are mentioned for their good quality and other desirable characters. Some cabbage varieties were also tested. Rode Nunhemer bewaar [Red Nunhem Keeping] is mentioned for its high quality; it also keeps well in winter. The white cabbage, Tardif d'automne [Autumn Late], from Holland has distinguished itself by the regularity of its growth and its good quality.

**Spinach.** The $F_1$ hybrid H56/1 has produced exceptionally large leaves of deep green colour carried on long petioles. Further hybridizations are also planned.

**Lettuce.** Sommerkönigin [Summer Queen] was found to be outstanding on account of its regular growth and lack of virus disease; the head is pale in colour, large and firm. The lettuce is ready for cutting in midsummer but does not bolt until a fortnight later, so making it possible to stagger the harvest.

**Celery.** Pedigree selection is under way.

**Chicory.** Selfings and hybridizations were attempted but in each case the quantity of seed set was very small. Success in propagating chicory by means of root cuttings has made possible the creation of vegetative lines.

**Tomato.** Amongst the collection of varieties studied, Farthest North was considered to be of breeding value on account of its earliness; it matures about eight days before other cultivated varieties. Immun is mentioned for the hardiness of its leaves which are resistant to unfavourable weather and parasitic organisms. Notes are provided on the field performance of six $F_1$ hybrid varieties from Holland. Other foreign $F_1$ hybrids were also tested in a greenhouse trial; Ware Cross gave the best performance. The lines H1/49–5–A2/1 (Premier x Tuckwood) and H2/49–1–B3/2 (Econoom [Economist] x Premier) produced good quality fruit, which were smooth, regular in shape and of a uniform red colour; these lines are to be multiplied for seed production. Hybrids with *Lycopersicon pimpinellifolium* in their parentage are being tested; from these it is hoped to produce varieties resistant to *Cladosporium fulvum*.

During 1957 a cross was made between H1/49–5–Pr2/2 and Farthest North, the aim being to produce early varieties.

Also crosses were made between hybrid lines developed at Gembloux and *L. glandulosum*, with a view to gaining types resistant to the corky root disease; these crosses were difficult to effect and it is not yet known whether their seed is viable.

**French bean.** Notes are provided on the performance of seven varieties recently tested. Some hybrids descended from a cross of Princesse double de Hollande x Servus showed good resistance to anthracnose and were also early. Other lines from the cross 5018 x Princesse double de Hollande have satisfactory resistance to virus diseases and anthracnose; they are a few days earlier than Princesse double de Hollande and the seeds are tender and fleshy. Two new hybridizations were effected in 1957, these being between Princesse double de Hollande and the varieties Schreibers Imuna and Resistent. In the varietal trials, Sabo, Wade and Meteor showed satisfactory resistance to anthracnose and virus diseases and their seed was noteworthy for its industrial qualities.

**Pea.** A large number of dwarf varieties were examined and two of these, Pixie and 2001, were found to be particularly promising. Pixie, produced by the American firm Asgrow, is very early, similar to Alaska and resistant to virus yellows, pea virus 8. Strain 2001 is a later French variety; it is resistant to virus yellows and has small seeds. Both these varieties are suitable for industrial purposes. The results are also reported of a trial in which several varieties were subjected to quick freezing, their quality being tested sometime after the treatment. Wyela and Délicieux gave the best results. Information is also given on the performance of various hybrids in different stages of development. Special mention is made of the dwarf line H48/32–93 which has seed characters rendering it suitable for both canning and freezing, it is also resistant to pea virus 8. Amongst the $F_7$ progeny of crosses involving the variety Stijfstroo [Stiff Straw], the line H50/I–64 has been outstanding, both with respect to its cultural characters and quality. New crosses effected in 1957 made use of the variety Pixie and the line H48/32–93, the aims being to produce early, productive varieties resistant to disease and having small seed of uniform colour and size. Pedigree selection is being carried out with some well known canning varieties in order to improve their yield.

168 Kuznecov, A.
**(A centre of agricultural science in Siberia).**
Nauk. pered. Opyt Sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 6 : 45–47. [Russian].

Mention is made of improved varieties of wheat, rye, maize, barley, grasses, legumes, potatoes and other crop plants bred at the Agricultural Institute in Omsk. Most of these varieties are characterized by plasticity with regard to climatic and soil conditions.

169 Service botanique et agronomique de Tunisie. Rapport sur les travaux de recherche effectués en 1956. **(Botanical and agronomic service of Tunisia. Report on research work carried out in 1956).**
**1** : Pp. 230; **2** : Pp. v + 255. (Mimeographed).

An account is presented of breeding and trials of Tunisian and introduced varieties of cereals, forage grasses, leguminous crops, flax, fruit trees, olive, grape, tomato and salad vegetables. Varietal differences in the susceptibility of hard and soft wheats to black rust and mealy endosperm are mentioned; differences in technological characters were also noted.

**Abstracts of the Annual Meetings of the American Society of Agronomy, Lafayette, Indiana 1958** : Pp. 76.

170 *Atkins, I. M., Reitz, L. P. & Johnson, V. A. Comparisons of awned* vs. *awnless isogenic lines of wheat in regional variety trials.* (*p. 43*).

An awned and an awnless isogenic line of winter wheat derived from Kanred × Clarkan were grown at 19 stations in seven states in each of three seasons. On the average the awned line surpassed the awnless in yield and test weight but this superiority was not significant. Differences between the two lines in dates of heading and ripening, plant height and resistance to leaf and stem rusts, lodging, bunt and Hessian fly were small and not significant.

171 *Bashaw, E. C. & Holt, E. C. Reproduction in dallisgrass,* Paspalum dilatatum. (*p. 43*).

A study was made of embryo-sac development and breeding behaviour to determine the mode of reproduction in (1) a highly fertile, yellow-anthered type from Uruguay and (2) the common type used extensively in the southern USA. The former reproduced sexually in a normal manner. The latter reproduced by apospory

and pseudogamy. The uniformity of its progeny and the apparent absence of aneuploids provided evidence of obligate apomixis. Competition among nucellar embryo-sacs was a factor contributing to the low seed set of (2). Hybridization of these two biotypes has been extremely difficult. A single apomictic hybrid was secured as the result of fertilization of an unreduced egg of (2). Embryo-sac development of the hybrid resembled that of the ♀ parent and no segregation was noted in the $F_2$.

172 *Brown, W. L. Evolutionary aspects of maize breeding.* (*p. 43*).

"Investigations during the last quarter century have resulted in considerable advance in understanding the evolution of maize. Equally important but less generally known are the results of breeding which have identified many of the world's most productive sources of maize germ plasm. This provides the breeder an opportunity for analyzing these various sources of elite germ plasm for factors which they may have in common. A survey of breeding experience involving a considerable number of the major Western Hemisphere races of maize suggests that most of those of superior productive capacity have undergone strikingly similar evolutionary histories. These facts will be discussed in relation to present breeding practices and materials and the Tripsacum-teosinte-maize complex. Consideration will also be given to the possible relationship between an understanding of gene action in heterosis and the evolutionary history of the experimental material employed."

173 *Buckner, R. C. & Fergus, E. N. Breeding tall fescue for improved palatability by selection within inbred lines.* (*p. 43*).

Spaced-plant nurseries of parental plants, clonal lines and one to four generations of inbred lines were grazed by dairy cattle two to four times annually during the period 1950–57. Significant differences in degree of grazing were obtained between lines in some nurseries. In general, the interaction between lines and dates of grazing was not significant, indicating that the animals tended to select certain lines throughout the year. Inbreds appeared to become fairly homozygous for factors affecting palatability after three generations of selection. All lines were reduced in vigour with each generation of inbreeding but little relationship existed between vigour and palatability. In an evaluation in sod plots, the polycross progenies of eight inbreds and a synthetic were on the whole significantly better grazed than the named varieties.

174 *Buker, R. J. & Davis, R. L. The inheritance of flower color in diploid alfalfa.* (*p. 43*).

A cross between true-breeding purple and yellow-flowered diploids resulted in 7 $F_1$ plants with green flowers. The $F_2$ segregated into plants with green, purple, yellow and cream flowers in numbers suggesting a ratio of 9 : 3 : 3 : 1. $F_3$ data corroborated this evidence of a two-factor mode of inheritance.

175 *Burton, G. W. Breeding methods for pearl millet* (Pennisetum glaucum) *indicated by genetic variance component studies.* (*p. 44*).

Since 1948, nearly 700 single crosses involving about 250 inbreds have been compared in 15 forage-yield tests in order to estimate additive and nonadditive genetic variances. On the average, 54·25% of the total genetic variance for forage yield has been nonadditive. Since nearly half of the genetic variance has been additive, some increase in yield may be expected as the result of straight selection. The high percentage of nonadditive genetic variance indicates that the maximum improvement in yield will be dependent on the use of $F_1$ seed. Tester crosses should be superior to top crosses in evaluating new inbreds. The $F_1$ hybrid Gahi–1, released in 1958, has outyielded the commercial control by as much as 50% in regional tests.

176 *Cleland, R. E. Evolution in* Oenothera. (*p. 44*).

Attention is drawn to the significance of chromosome configurations in interracial hybrids of *Oenothera* in furnishing a clue to relationships between races. In many cases the actual pathways by which races have diverged and become differentiated may be traced.

177 *Cockerham, C. C. Implications of genetic variances in a hybrid breeding program.* (*p. 44*).

"Crosses among unselected inbred lines may be considered to be random members of a random mating population from which the inbred lines were derived. This is true for single crosses, 3-way crosses, double crosses and other crosses, as long as no line appears more than once in any cross. These conditions allow the expression of the covariances between relatives (crosses with various degrees of relationship to each other) in terms of fractions of the genotypic variance. The covariances between all possible types of relatives among single crosses, 3-way crosses and double crosses resulting from a set of

random inbred lines are given. The implications of these covariances are considered for several factors, some of which are (1) the estimation of genetic variances, (2) the choice of type of cross from which to select, and (3) the prediction of performance, e.g., predicting performance of double-crosses from that of single crosses. Some of the inferences are discussed relative to present hybrid corn procedures."

178 *Creech, R. G. & Kramer, H. H. Gene interaction in* Ricinus communis. (*p. 44*).
Four major genes, designated *Y*, *R*, *I* and *M*, proved to be responsible for a wide range of plant colours. In green plants, *y* resulted in yellow capsules. *R* caused the production of red capsules in *y* and purple capsules in *Y* plants. *I* behaved as an inhibitor of purple but not of red coloration of the capsules. Either *R* or *M* resulted in maroon stems. In the absence of *R*, however, *y* or *i* inhibited *M*. At least one partially dominant factor, *S*, controlled the production of spines on the capsules. Modifiers of dominance were detected in certain crosses. Three factors, *A*, *B* and *C*, were involved in the inheritance of bloom, *A* and *B* being dominant complementary factors for bloom production and *C* an intensifier of their action.

179 *Crowley, A. J. & Jugenheimer, R. W. Efficient evaluation of oil content in inbred lines of corn.* (*p. 44*).
All possible crosses were made between nine standard inbreds ranging in oil content from 2·7 to 5·8%. Each inbred was also crossed with five testers to determine general and specific combining ability. The testers were low, intermediate or high in oil percentage and comprised WF9, R30, Illinois Low Oil, Illinois High Oil and an open-pollinated composite. It was concluded that the relative ranking of inbreds for oil content was similar to their ranking in hybrid combinations. All the testers with the exception of Illinois High Oil gave satisfactory results.

180 *Emery, D. A. & Smith, W. K. Seedling selection for persistence in red clover.* (*pp. 44–54*).
"A study was made to evaluate various plant character-persistence associations in single crossed progenies from parents with particular growth types. Pairs of parents were selected and selfed in the seedling year within rows arising from individual open-pollinated plants. Each pair of parents was chosen as having the same fall growth types. Progeny means for type compared well with that of the parents. Differentiation of progeny persistence on the basis of parental type was dependent upon the general hardiness of the row from which the parents were selected. Individual plant studies showed that fall flowering, length of stem, and size of rosette were correlated with survival. Fall flowering combined with size of rosette served as a better indicator of persistence than either factor separately. Differences among progenies of similar fall growth types and persistence were found in the second season."

181 *Fejer, S. O. Selection and inbreeding progress for high and low producing* Lolium perenne. (*p. 45*).
"Very slow selection progress for high and low herbage yield in diallel crosses between outstanding *Lolium perenne* pasture plants confirmed earlier low heritability calculations. Heritability values were checked in the first two generations only, when noninbred controls were still available from outcrosses between selfed lines (started from the same stock and selected for both extremes). Even these values are disturbed by apparent heterosis effects in these controls: in later generations, increasingly depressed by half-sibbing, calculation without controls would have been unrealistic. The productivity of both 'high' and 'low' lines is still steadily decreasing in the latest fifth generation. Some characters, correlatedly responding to selection, particularly tiller number and ear emergence, still achieve new extremes in both directions. Other characters are negatively correlated to these. The selfed line selection, switched to self-fertility after the second generation, remained similar in character structure. All lines are used to explore differences in physiological responses possibly related to the morphological correlations, e.g., applied growth substances, photoperiods, vernalization, and optimal growth temperatures. Explanations proposed for the high genotype-environment interactions between seasons, gives temporary competition advantages to the 'low' lines. Understanding such problems may improve this material more efficiently than selection index construction attempted earlier."

182 *Fleming, A. A., Kozelnicky, G. M., Browne, E. B. & Carmon, J. L. Variations between stocks of the same inbred line of maize.* (*p. 45*).
Evidence was obtained indicating that well-established inbreds may undergo appreciable changes in various characters, when maintained in different environments after distribution from the station where they were developed.

183 *Frakes, R. V. Heritability estimates and genetic potentials in alfalfa as affected by clipping treatments and stage of growth.* (*p. 45*).

Ten plants were multiplied vegetatively and transplanted into a replicated space-planted nursery. Each replication contained three 5-plant rows in a split-plot arrangement to permit different harvesting treatments of the same genetic material. Observations were on the following, recorded at various intervals throughout the growing season: height, width, length of longest stem and number of internodes on the longest stem. Dry-matter yields were determined after differential growth periods. Some characters showed greater genetic variability as the plants became more mature. The time required to stabilize this variability differed according to the character. For example, plant width showed maximum genetic variability about 25 days after clipping, then remained the same or decreased with subsequent growth. Height reached a maximum expression of genetic variability in about 15 days after clipping, then remained fairly constant with subsequent growth. "The range of genetic expression was different for different clipping treatments".

184 *Frankel, O. H. & Morley, F. H. W. An ecogenetic research program with an introduced plant.* (*p. 45*).

Attention is drawn to the fact that introduced pasture species, such as lucerne and subterranean clover, have a low degree of genetic specialization in Australia. A project is in progress as the result of which it is hoped to develop locally adapted strains of subterranean clover by natural selection, both within and beyond the existing range in habitat. Mixed pure lines and hybrids are being subjected to an array of natural environments. Variability of introductions from diverse original habitats is also being studied. By an ecogenetic analysis of the populations, the relative significance of several characteristics in establishment and survival is being determined.

185 *Fraser, A. S. Simulation of genetic systems by automatic digital computers.* (*p. 46*).

"The use of electronic computers to solve the problems imposed by linkage, number of genes, interactions, etc., in the prediction of rates of advance under selection is discussed. This procedure involves simulating the breeding structure of the populations and imposing different restrictions on the definition of the genetic system."

186 *Frey, K. J. Effect of planting date on yield components in oats.* (*p. 46*).

An analysis was made of the relative effects of late planting on (1) number of panicles per plant, (2) number of seeds per panicle and (3) weight per seed in Andrew, Sauk and Bonham in Iowa. Late planting noticeably reduced all three yield components in Bonham, and (1) and (3) in Andrew and (2) and (3) in Sauk. In Andrew, (2) increased while in Sauk (1) was maintained at a high level.

187 *Futrell, M. C. & Atkins, I. M. Studies of irradiated Alamo and Mustang oats.* (*p. 46*).

$F_5$ lines of Alamo possessing resistance to *Helminthosporium* blight (*Pyrenophora avenae*) but otherwise indistinguishable from the parent variety have been secured from material derived from X-irradiated seeds. Lines differing considerably from Alamo and Mustang in growth habit have also been obtained. Marked differences among the lines in resistance to low temperature were observed in 1955.

188 *Grafius, J. E. A geometric viewpoint of quantitative genetics.* (*p. 46*).

The author extends his geometrical mode of analysis of yield [cf. XXVII, 1664]. "Geometrically, yield in small grain is the volume of a rectangular parallelepiped with edges, X, Y, and Z equal to number of heads per unit area, number of seeds per head, and average kernel weight, respectively. The yield W equals the volume X Y Z, all terms being expressed as percentages of a sample population. Then in turn, heterosis results from special combinations of X, Y, and Z to give nonlinear increases in yield. Clear cut epistasis is found whenever X, Y and Z are independent and the interaction of the three edges produces heterotic effects in yield. Again, the interaction of additive by additive effects would simply be the multiplicative effects of the additive components in X, Y, and Z. The interaction of additive by nonadditive effects would be explained in a similar manner. The implications of these geometrical interpretations of biometrical genetics should greatly modify selection procedures. For example, the above interpretation of epistasis clearly points a way for fixation of so-called 'heterotic' effects in true breeding lines. The relationships of the genotype to its environment is again essentially one of geometry. The recently developed vector technique draws a

picture of the genotype and the genotype-environment interaction."

189 *Hart, R. H. & Wilsie, C. P. Inheritance of a flower character, brown keel tip, in* Lotus corniculatus *L.* (*p. 46*).

In a cross between the variety Empire, having brown keel tips, and a selection of Viking with normal yellow flowers, the former character depended on a tetrasomically-inherited single dominant gene, *B*. A significant difference in seed set between brown x brown and yellow x yellow crosses among $F_2$ plants, as well as a deficiency of yellow-flowered phenotypes in several progenies, indicated the operation of a lethal mechanism affecting the genotype for yellow flowers. The presence of a second tetrasomically-inherited locus, *C*, was postulated, which interacts with locus *B* so that the genotype *bbbb cccc* is lethal.

190 *Henson, L. & Diachun, S. Autogamous red clover.* (*pp. 46–47*).

A single plant characterized by a heritable capacity to set selfed seed without artificial tripping has been discovered at the Kentucky Agricultural Experiment Station. The plant has been crossed with self-sterile clones to study the mode of inheritance of its autogamy.

191 *Jenkins, B. C. Genome construction among the Triticinae.* (*p. 47*).

Work at the University of Manitoba is reported. Together with the natural hexaploid of *Triticum aestivum* 'Chinese Spring' (ABD) and the natural tetraploid *T. durum* 'Stewart' (AB), the following synthetic hexaploids were crossed by the diallel method in 1957: (1) ABD, with genome D from *Aegilops squarrosa*, (2) ABE, with E from diploid *Agropyron elongatum*, (3) ABR, with R from *Secale cereale*, (4) $ABS^1$, with $S^1$ from *Ae. longissima* and (5) ABV, with V from *Haynaldia villosa*. In a typical hybrid from hexaploid crosses, the $F_1$ plants have 14 pairs of chromosomes and 14 unpaired chromosomes. Segregation of the latter should result in entirely new combinations in sets of seven involving, for example, one chromosome of one genome with six from another and so on until the numerical situation with respect to the two genomes is completely reversed. The view is expressed that some of the new combinations of three parental forms may possibly lead to the development of types with considerably greater potential for food production than the grain crops now available.

192 *Jenkins, J. N. & Kramer, H. H. The genetic and cytological location of the gene* ae *in maize.* (*p. 47*).

The gene *ae* (amylose extender) for increased amylose content is situated within a previously unmarked region distal to *bv* and proximal to *pr* on chromosome 5, between map positions 14.1 and 20.7. The gene is near the break in T4–5c at 51.27, the recombination value between *ae* and the translocation break being $1.70 \pm 0.74$. Two sites for the break positions in T4–5g have been reported in the literature, either 4S.48 and 5L.30 or 4L.27 and 5S.70. Data obtained by the authors suggest evidence of a breakage site at 5S.70.

193 *Jones, A. & Hanson, C. H. Recovery of the creeping-rooted habit in $F_2$ families from a wide array of alfalfa crosses.* (*p. 47*).

$F_2$ families obtained by crossing three Canadian creeping-rooted lines with three hay-type varieties (Buffalo, Caliverde and African) and 12 North Carolina clonal selections were studied. Twice as many creeping plants were recovered from crosses with Buffalo as from crosses involving Caliverde or African. None of these individuals developed the creeping habit as early or as vigorously as the creeping-rooted parents. Complex inheritance was also indicated by the low frequency of recovery of creeping-rooted individuals and by some significant (unspecified) interactions. Crown width was significantly correlated with number of creeping plants.

194 *Jones, G. L., Matzinger, D. F. & Collins, W. K. A comparison of certain flue-cured tobacco varieties over locations and years.* (*p. 47*).

It is reported that data from trials in North Carolina were analysed with a view to deciding upon the most effective number of years, localities and replications for the evaluation of varietal performances.

195 *Jugenheimer, R. W. Corn hybrids with higher oil or protein content for industry and livestock.* (*p. 47*).

The character of high content of oil or protein was transferred to standard inbreds by back crossing. Development of inbreds with high oil content was accomplished by selecting ears bearing kernels with large germs. The oil content of the new inbreds ranged from 4 to 10%, compared with 2 to 5% in the original lines. Selection for high protein content

included choice of ears with hard flinty kernels. Protein content of the new lines varied from 11 to 22%, as against 11 to 14% in the original inbreds. In general, back crossing to high-oil or high-protein strains resulted in higher content of oil or protein but lower grain yield than back crossing to the original inbreds. Ill. 6021 and Ill. 6052, double-cross hybrids involving recovered inbreds, averaged 25% more oil and 10% more protein than standard hybrids, which they resembled in grain yield and other agronomic characters. Foundation single-cross seed for the production of three hybrids is expected to be available in 1959.

196 *Kehr, W. R. & Gardner, C. O. Genetic variability in Ranger alfalfa.* (*p. 48*).
Replicated trials consisting of cuttings and polycross progenies of 96 clones of Ranger chosen at random were established at two diverse locations on the Agronomy Farm of the Nebraska Agricultural Experiment Station, observations being recorded for a two-year period. About 35% of the total genetic variance was additive. Estimates of heritability for forage yield based on plot means approached 0·25. By selecting the top 10% of the clones as regards yield and combining them into a synthetic, an advance in yield of slightly over 9% of the general mean may be expected. Genetic correlations between clones and polycross progenies for yield were respectively 0·39 and 0·77 for locations 1 and 2.

197 *Kohel, R. J. & Davis, R. L. The inheritance of growth type in alfalfa and its relation to cold resistance.* (*p. 48*).
The four plants chosen as parents and crossed in all possible combinations represented extreme and intermediate types in cold resistance, as well as in growth habit as expressed in degree of dormancy. The parent clones, selfs and $F_1$s were evaluated for growth type in both greenhouse and field. The correlation coefficient between the greenhouse and field evaluations was highly significant ($r = +0{\cdot}82$). The growth types of the $S_1$s were similar to those of the parents, while the $F_1$s were intermediate and no more variable than their parents. Cold resistance was estimated on the basis of the specific conductivity of exosmosites from frozen root tissue. It was significantly correlated with growth type, the variability of the $F_2$s being no greater than that of their parents. The parent clones were homozygous for growth type and cold resistance. The action of the genes controlling the two characters was additive.

198 *Li, H. W. Cytological studies of sugarcane and its relatives.* (*p. 48*).
The type and number of univalents, bivalents, trivalents and quadrivalents in crosses of *Saccharum officinarum* x *Sclerostachya fusca* to *Sclerostachya fusca* and *Narenga porphyrocoma* provided evidence for the conjecture that the 10 basic chromosomes of sugar cane are probably made up of 2 sets of 5. It is postulated that *S. officinarum* with $2n = 80$ originated as the result of hybridization between two unidentified species with $n = 5$, segmental allopolyploidy and, finally, two successive autopolyploidizations.

199 *Lima-de-Faria, A. Comparative structure of the kinetochore at mitosis and meiosis.* (*p. 48*).
The centromere (material studied unspecified) has the same structural pattern in mitosis and meiosis. The chromomeres and fibrils may be seen *in vivo* as well as in fixed material. As many as four chromomeres may be present at metaphase I in a single centromere. At metaphase I, the centromere attains a total length generally equal to or exceeding that of the arms. At mitosis the centromere folds only slightly. At meiosis it folds to a much larger extent, becoming oriented parallel to the spindle axis.

200 *Mason, L. & Henderson, M. T. Inheritance of resistance to root lodging in corn.* (*p. 48*).
In hybrids and back crosses involving the resistant inbred Mp313 and susceptible inbred L2–2, resistance to root lodging behaved as a quantitative character, but observations made in 1956 on the $F_1$, $F_2$ and first-generation back crosses suggested that resistance was partially dominant whereas those recorded in 1957 on the $F_3$ and second-generation back crosses were indicative of partial dominance of susceptibility. Estimates of gene number and heritability were calculated.

201 *Maunder, A. B. & Pickett, R. C. The genetic inheritance of cytoplasmic male sterility in grain sorghum.* (*pp. 48–49*).
A single recessive gene was found to interact with the requisite type of cytoplasm to produce male sterility.

202 *Moll, R. H., Robinson, H. F. & Cockerham, C. C. Genetic variability in the advanced generation of the cross of open-pollinated varieties of maize.* (*p. 49*).
The additive genetic variance in a segregating population derived from a cross between two

open-pollinated varieties was greater than that of each variety and considerably greater than that of the $F_1$. The mean yield of the advanced generation was slightly higher than the average of the two varieties but considerably below the mean of the $F_1$. Expected genetic advance through full-sib family selection and reciprocal recurrent selection suggested that the advanced generation provided a more desirable basis for selection than the varieties.

203 *Nandpuri, K. S. & Foote, W. H. Inheritance of plant height, date of heading and tillering in three wheat crosses.* (*p. 49*).

Inheritance of the above three characters was investigated in crosses of the tall, late-maturing winter wheats Alba, White Winter and White Holland with the short-strawed Japanese variety Norin 10 [Ministry of Agriculture and Forestry 10]. Earliness of heading was partially dominant over lateness and dependent on at least two factors. A small number of genes controlled plant height, tall straw being partially dominant over short. The mode of inheritance of tillering could not be established; the parents and $F_1$ were as variable as the $F_2$ and $F_3$. Heritability values for heading date, height and tillering were respectively 93·2, 88·4 and 24·4.

204 *Nielsen, E. L. Some fertility relations in polyploid grasses in relation to cytology.* (*p. 49*).

"Small plants" of *Bromus inermis* gave no or very little seed set after selfing or open pollination. Male sterility in these plants appeared to be related to nucleic-acid disturbances, precocious separation of the chromosomes, failure of cytocinesis and consequent formation of cenocytes, inversions, floret reversions and possible direct genetic effects.

In *Phleum pratense*, seed set after selfing varied from plant to plant, a range from complete sterility to moderate fertility being noted. In general, seed set appeared to depend on degree of meiotic regularity. Most plants showed either disomic chromosome behaviour or the maximum number of quadrivalents. Variation in seed set after open pollination was observed in all families.

"Second A–$T_2$ bridges, I's and $\frac{1}{2}$ I's occur in 7 and 11% of the cells of two plants wherein no A–$T_1$ bridges or I's were observed. Both plants were of modal seed set compared to other plants. Progenies from these varied from very low to very high seed set."

205 *Nielsen, E. L. & Dickson, J. G. Evaluation of timothy clones for stem-rust reaction.* (*p. 49*).

Parental clones and selected plants from polycross progenies were subjected to artificial inoculation with *Puccinia graminis* var. *phleipratensis* in the greenhouse. Two inoculations, one during vegetative growth and the other at or immediately following heading, were necessary for the elimination of susceptible plants. A single reading, taken about three weeks after inoculation, may be sufficient for general screening. Type of uredial infection and percentage of tissue infection gave essentially similar results when inoculation was carried out during the vegetative stage. The former criterion was more effective than the latter in eliminating susceptible plants when inoculation was effected at the heading stage. No relationship was found between the reactions of the parents and plants selected from their progenies. This was to be expected since little or no selection for resistance had been made among the parents while only plants chosen for apparent resistance in the field were represented among the progenies. The technique was not applied to seedlings.

206 *Pawlisch, P. E. & Shands, H. L. Inheritance of bushel weight and other grain quality factors in oats.* (*p. 49*).

Kernels from the three earliest panicles of individual, spaced $F_2$ plants of (1) Clintafe x Beedee and (2) X436–8 x CI5190 were graded for size. The mean percentage of $F_2$ plants with plump kernels in (1) was above each parental value but below it in (2). In the $F_3$ of both crosses, lines closer in bushel weight to the parent with the lower value in this respect occurred more frequently than lines approaching the parent with the higher bushel weight. Few lines significantly superior to the parents in bushel weight were recovered. $F_4$ bushel weights tallied with $F_3$ values. Data on segregation for kernel shape indicated that types differing considerably from each parent occurred with a relatively high frequency.

207 *Pergament, E. Inheritance of two unifoliolate leaves in alfalfa.* (*p. 50*).

Preliminary data suggested that the seedling character of two unifoliolate leaves instead of one is conditioned by a recessive, tetrasomically inherited gene.

208 *Porter, K. B. & Daniels, N. E. The inheritance of greenbug resistance in wheat.* (*p. 50*).

In the cross resistant Dickinson selection x

susceptible Concho, reaction to aphids was controlled by a single major pair of factors and one or more modifiers, with susceptibility partially dominant.

209 *Rick, C. M. Hybrid incompatibility as a factor in speciation.* (*p. 50*).

Some wild races of *Lycopersicon peruvianum* which are completely cross-incompatible with each other may be crossed successfully with others intermediate in geographical situation. Failure of hybridization is due to defective endosperm development and shows no relationship with the self incompatibility prevailing in the species. Inheritance of hybrid incompatibility is complex and differs in reciprocal crosses. According to the evidence from *Lycopersicon* and other genera, barriers to crossing are probably achieved in a stepwise fashion, consequent to progressive geographical and other types of isolation. Sympatric distributions of cross-incompatible species may often be interpreted as the result of the overlapping of species which acquired hybrid incompatibility during former isolation.

210 *Schaller, C. W. Effect of latent bunt infection on resistant wheat varieties.* (*p. 50*).

Seed inoculation of resistant wheats with spores prior to planting reduced grain yield by 4 to 25%, exclusive of the infected ears which occasionally developed. The differential reduction shown by four varieties, each possessing the Martin factor for resistance, ranged from 10 to 24%. Significant differences were found between two isogenic strains of Baart, respectively possessing the Martin and Turkey factors. Reduction in tiller number accounted for most of the decrease in yield.

211 *Schnell, F. W. On plant selection in successive stages.* (*p. 50*).

"Evaluating new varieties (or testcrosses, respectively) for quantitative characters such as yield is a primary task of the plant breeder, requiring replicated field trials over several places and years. After each year a number of the strains tested is often discarded, the fraction retained for the next stage of selection mostly being fixed by practical considerations. The problem of balancing the successive frequencies of selection with the object of maximizing the gain in the character(s) under selection does not seem to have received adequate attention as yet, though Cochran (1951) has given an exact solution for two stages of selection in some detail. The present paper deals with the possibility of replacing the exact method, which will become rather complex with more than two stages, by an approximative formula. Furthermore, it is pointed out that in computing the expected gain from selection the interactions of strains with locations and with years should be allowed for by including their components of variance in the error terms used. The influence of doing so on the optimum frequencies of selection is discussed."

212 *Sentz, J. C. Hill-plot technique for soybean investigations.* (*pp. 50–51*).

The hill-plot and two-plot methods were compared as means of varietal evaluation. Varieties were ranked similarly for plant height or earliness of maturity by the two methods but inconsistently for yield.

213 *Stanford, E. H. A genetic character in alfalfa illustrating a relationship between dosage and dominance in tetrasomic inheritance.* (*p. 51*).

Zebra leaf, characterized by transverse chlorotic striping, was only expressed in plants simplex for the gene concerned, their progenies segregating into normal and zebra types in a 1 : 3 ratio. Duplex plants had normal leaves and gave progenies segregating into normal and zebra individuals with a 3 : 1 ratio. Only normal offspring were obtained from triplex plants. It is pointed out these ratios could be mistaken for disomic ratios if only one segregating generation were studied. The type of inheritance shown by zebra leaf may account for some of the earlier reports of disomic inheritance in lucerne.

214 *Thompson, D. L. & Rawlings, J. O. Ear height comparisons involving four testers in corn.* (*p. 51*).

Six dwarf and 26 "low normal" inbreds were crossed with single-cross testers, 1, 2, 3 and 4 having ear heights of 21, 29, 47 and 58 in. respectively. Ear heights of inbreds grown separately were significantly correlated ($r$ = 0·664) with inbred performances as regards ear height, expressed as averages for all four tester combinations. Ear heights in crosses of the six dwarf lines with tester 1 were less than 25 in. Average ear heights were respectively 38, 37, 42 and 48 in. in crosses of the remaining 26 inbreds with testers 1, 2, 3 and 4. In a variance analysis of the data on ear height from the crosses with the low normal inbreds, the effects of locality, inbred and tester and the interactions inbred x locality, inbred x tester and tester x locality were significant. The simple

correlations obtained indicated that the lines were graded with a fair degree of similarity by the four testers. In the single trial year, yields from crosses with the 26 low normal inbreds averaged 64, 54, 59 and 55 bushels per acre for testers 1, 2, 3 and 4 respectively.

215 *Townsend, C. E. The inheritance of some types of sterility in sudangrass.* (*p. 51*).
[Cf. XXVII, 4091].

216 *Weibel, D. E. Heritability association of characters in hard red winter wheat.* (*p. 51*).
Data from five hard red winter wheat crosses provided the following heritability values: date on which first flower appeared, 46%; plant height, 42%; kernel weight, 52%; and bushel weight, 56%. Individual-plant selection for these characters in the $F_2$ is likely to be moderately effective, although it would probably not be equally effective in all combinations. Heritability estimates for number of ears and grain yield were respectively 7 and 15%. From the point of view of breeding, the strong association found between kernel weight and bushel weight was considered to be the most useful among the 15 correlations calculated.

217 *Yeh, P. S. & Henderson, M. T. Effects from irradiation of dormant seed of rice with gamma rays and neutrons on several characteristics of the $R_1$ generation.* (*p. 52*).
The frequency of translocations resulting from neutron treatment was very low compared with that induced by $\gamma$ rays. For example, at dosages causing 50% reduction in survival, $\gamma$ and neutron irradiation induced translocations at a frequency of 0·5 and 0·24 per panicle respectively. With the exception of reduction in fertility, seed and plant injury caused by neutron treatment were not primarily due to chromosome aberrations.

218 *Laude, H. M. & Stanford, E. H. Effect of environment on seed production of parental lines entering a ladino clover synthetic.* (*pp. 55–56*).
Differences in the response of parental clones of the synthetic variety Pilgrim to environmental conditions affected the amounts of the seed contributed by the clones.

219 *Singh, H. G. & Lamb, C. A. Mineral and protein content of wheat grain as influenced by variety, soil, and fertilizer.* (*p. 57*).
[Cf. XXVIII, 2772].

220 *Lowe, A. E. Protein content and grain yields of hybrids and varieties of grain sorghum.* (*p. 61*).
Seven $F_1$ hybrids involving cytoplasmically male-sterile lines were compared with five varieties in a two-year trial in Kansas. The average protein contents of the varieties after fallow and under fully irrigated conditions were respectively 2% and 16% higher than the corresponding contents of the hybrids. The yields of the hybrids after fallow and with full irrigation were respectively 48% and 38% higher than those given by the varieties under similar conditions.

221 *Goetze, N. R. & Pickett, R. C. A comparison of methods of evaluating Zoysia turf breeding material.* (*p. 65*).
"During a 2-year evaluation of 993 space planted Zoysia entries arising from 45 different genetic sources, critical visual estimates and objective measurements of morphological factors contributing to turf quality, were compared. Cover was estimated visually, by presence and by absence of vegetation in subquadrats. Leaf height, leaf width, stolon number, stolon length, and stolon internode length were compared. Simple correlation studies were conducted on all possible combinations of the above eight factors. Multiple correlations were computed to find the best combination of two or more morphological characters, which contributed most heavily to cover as measured by each of the three methods."

**Proceedings of the 55th Annual Convention of the Association of Southern Agricultural Workers held in Little Rock, Arkansas, February 3, 4, 5, 1958.** Pp. 257.

222 *Kozelnicky, G. M. & Fleming, A. A. Heterofertilization and pleiotropism in an inbred line of maize.* (*p. 54*).
The character of "lemonade" endosperm discovered in an ear of inbred GT112 was due to a single recessive mutation with a pleiotropic action on chlorophyll production, 98·55% of the lemonade kernels giving rise to albino seedlings. Data on the segregation for the endosperm character in the green plants obtained from the remaining 1·45% indicated that these plants were the result of heterofertilization.

223 *Fleming, A. A., Kozelnicky, G. M., Browne, E. B. & Crews, J. W. Cytoplasmic influence on agronomic characters in maize.* (*pp. 54–55*).
The four inbreds of the same double hybrid

were combined in different ways so that the effect of each inbred in its role as ♀ in the single cross used as the seed parent could be studied. A cytoplasmic effect was demonstrated in respect of yield, lodging, plant and ear heights and date of silking.

224 *James, E. The Southern Regional Plant Introduction Station in operation.* (*pp. 62–63*).

The role played by the above station in crop improvement in the southern USA, by supplying material to breeders and in other ways, is outlined.

225 *Thurman, R. L. & Taylor, M. The association of percentage of stalks and green weight yields of sorgo.* (*p. 65*).

The above two characters were positively correlated in a cross between Tracy and an introduction, respectively representing parents with a high and low percentage of stalks.

226 *Merkl, M. E., Pfrimmer, T. R., Furr, R. E. & Lloyd, E. P. Susceptibility of cotton varieties to Thimet seed treatment and insects at Stoneville, Mississippi.* (*p. 121*).

Varietal differences were observed in the effect of thimet upon stand and in susceptibility to thrips and aphids. Pilosity was a major factor determining number of insects per plants.

227 *Greene, J. T. Forest tree improvement and its possible effects on small woodland management.* (*pp. 130–31*).

The role of genetics in facilitating the development of superior genotypes for new plantings or improvement of existing stands by mass selection of the best trees as parents is discussed. Attention is drawn to the individual-tree variation observed at the University of Georgia in seed setting per cone in controlled and open pollinations of *Pinus taeda* and *P. elliottii*. Such variation is an important consideration in planning a seed orchard or seed-production area.

228 *Drain, B. D. Fire blight resistant pears.* (*p. 141*).

Fire-blight resistant varieties are available for the south-eastern USA and others are anticipated. Two new resistant varieties recently introduced by the Tennessee station are mentioned.

229 *O'Rourke, E. N.* (*Jun.*). *Some results of two years' work in the fig breeding program in Louisiana.* (*p. 141*).

In investigations on hybrid seedlings at the Louisiana Agricultural Experiment Station, certain parents gave rise to progenies which were more resistant to rust than those from others.

230 *Hawthorne, P. L., Miller, J. C., Wilson, W. F., Horn, N. L.* (*Jun.*) *& Sistrunk, W. A. The Headliner strawberry, a commercial variety or parent.* (*p. 159*).

Introduced in 1957 by the Louisiana Agricultural Experiment Station, Headliner bears fruits attractive in appearance, good in quality and suitable for processing. It fruits early and is productive over a long season. Preliminary data on seedling yields suggest that Headliner may be valuable as a parent.

231 *Watts, V. M. Mutations in watermelon resulting from gamma ray irradiation.* (*p. 165*).

Three sterile variants induced by $\gamma$ irradiation of seeds of Sugar Baby bore fruits equal or superior to those of commercial triploids as regards the seedless condition. One of the variants had nonpubescent stems and leaves. All the ♂ flowers formed by the nonpubescent mutant and most of those on plants of the two pubescent mutants failed to produce pollen. A fourth mutant, completely fertile, was characterized by reduced chlorophyll production in the foliage. The four mutants were tentatively classed as monogenic recessives.

232 *Demaree, K. D. The effect of variety on the quality of frozen green soybeans.* (*pp. 165–66*).

Moisture percentage, colour and oil content were influenced by both variety and stage of maturity. Shear resistance gave an indication of seedcoat toughness and appeared to be correlated with oil content. Varieties found to be the most acceptable by a taste panel were Aoda, Hahto, Rokusum, Tastee, Etum, Willomi and Kanro.

233 *Rosen, H. R. Landhafer derivatives bred for resistance to newer races of crown rust and for other qualities.* (*pp. 212–13*).

Most of the oat varieties grown in Arkansas succumbed to the crown rust epidemic of 1957 in which races 213 and 216 were predominant. Oats of the Red Rustproof type appeared resistant and some selections of [Fulwin x (Lee-Victoria) x Bonda] x Landhafer were resistant not only to these races of crown rust but also to other locally important oat diseases.

234 *Blackmon, C. W. Differences in amino acid utilization by* Xanthomonas malvacearum *races 1 and 2.* (*pp. 216–17*).

Differences and similarities between the above

races in aminoacid utilization are noted. The aminoacid content of cotton leaves, stems and bolls may be involved in physiological resistance to *X. malvacearum.*

235 *Bird, L. S. The number of days from inoculation to first symptoms, a measure of the degree of resistance to the bacterial blight disease of cotton.* (*p. 217*).

The following investigations were carried out on resistance due to $B_7$. "Thirty-two plants of an $F_2$ progeny were grown in the greenhouse during the winter of 1948–49. The mean disease grade, mean days from inoculation to first symptoms and an index obtained by dividing the grade by the number of days were calculated for each plant.

"The genotype of the greenhouse plants was determined by progeny tests grown in the field. The correlations, all highly significant, between field progeny mean grade and individual plant mean grade, mean days, and index were respectively + ·92, — ·81 and + ·89. The highly significant correlation between individual plant mean grade and mean days was — ·92. The regression of progeny mean grade on individual $F_2$ plant mean grade, an estimate of heritability, was 0·79.

"The high association between the degree of resistance and days from inoculation to first symptoms indicated that resistance was due to a physiological mechanism which deprived the organism of an adequate source of energy."

236 *Bain, D. C. Reaction of red and white clover introductions to root-knot nematodes.* (*p. 219*).

Tests of introductions in Mississippi suggested the possibility of developing white clover resistant to both *Meloidogyne incognita* var. *acrita* and *M. javanica*, and red clovers resistant to both *M. arenaria* and *M. javanica.*

237 *Powell, N. T. & Nusbaum, C. J. The effect of root-knot nematode resistance on the incidence of black shank in tobacco.* (*p. 220*).

Resistance to *Meloidogyne incognita* and *M. incognita* var. *acrita* was incorporated into black-shank resistant flue-cured tobacco by back crossing. The USDA breeding line Bel 4–30 was used as the source of nematode resistance, Coker 139 and Dixie Bright 101 being the recurrent parents. Data on back-cross segregates susceptible and resistant to *M. incognita* and the recurrent parents indicated that nematode attack increased the incidence of black shank. The implication of this result for the breeder is indicated.

238 *Young, P. A. Deleterious changes in tomatoes resulting from irradiation of seeds.* (*p. 227*).

Treatment of seeds of Manalee with $\gamma$ rays or thermal neutrons induced mutations with deleterious effects such as dwarfing and chlorosis. No plants resistant to *Sclerotium* (*Pellicularia*) *rolfsii* were found among the 1015 $R_2$ plants inoculated.

239 *Burns, R. E. The astringent fraction of sericea lespedeza.* (*p. 227*).

[XXVIII, 3043].

240 *Joham, H. E. & Bird, L. S. Some biochemical investigations on cotton varieties resistant and susceptible to the bacterial blight organism.* (*p. 236*).

Girdling and N supply had no effect on the reaction of the closely related varieties D–4–42 and DP15 to *Xanthomonas malvacearum.* Under all conditions D–4–42 was resistant to race 1 while both varieties were susceptible to race 2. Leaves of D–4–42 contained more water-soluble protein, water and alcohol-soluble N and total water-soluble N than leaves of DP15. In addition, leaves of the former variety contained more aspartic and glutamic acid and less tyrosine than those of DP15. The differences in chemical composition may not however be associated with disparities in response to the pathogen. In the low N treatments leaves of D–4–42 had lower N fractions and content of water-soluble protein than those of DP15 in the high N treatment, although the reactions to the two races remained unaltered.

241 **Annual Report of Agricultural Experiment Stations, University of Florida, for the fiscal year ending June 30, 1957.** Pp. 397.

Varietal trials have been carried out with the crops mentioned below and also with rice, sorghum, pearl millet, forage grasses, jute, cotton, sesame, groundnut, litchi, *Macadamia*, carrot, radish, onion, spinach, lettuce, cucumber and pea.

**Wheat.** Several adapted winter types were selected for rust resistance in the International Winter and Spring Wheat Rust Nurseries and will be used in breeding for resistance.

**Oats.** A new race of crown rust in the 263–274 group attacked all lines in the oat nursery with the exception of 260 lines derived from irradiated Floriland and one line from nonirradiated Floriland. The resistant plants all showed mature plant resistance and will be tested for their seedling reaction. A population of awnless and

basal-hairless mutants from Floriland were unexpectedly found to be susceptible to *Helminthosporium victoriae.*

In the north Florida area a new race of crown rust tentatively identified as 276 caused considerable damage. Some oat lines apparently carrying resistance to this race were selected from irradiated material. Lines resistant to the common rust races were also selected.

Some promising lines have been found to be susceptible to grey speck, caused by manganese deficiency. Physiological and symptomatological races of *Helminthosporium* (*Pyrenophora*) *avenae* have been found to occur. A table is included showing the seedling and mature plant reaction of some selections in the Uniform Oat Rust Nursery to stem rust race 7A and crown rust race 216 and the "Landhafer races".

**Rye.** The first generation has been obtained from wheat-rye hybrids back crossed to rye. About 2000 $S_1$ plants were selfed as part of the programme for developing inbred lines of rye. The release of selection 8–21 as Gator is noted. [Cf. XXVII, 3969].

**Maize.** A high-yielding, new, yellow hybrid, similar to Dixie 18 and named Florida 200, was released to seed producers in 1957. Tests were made to measure progress in two different recurrent selection experiments. It is reported from the Everglades Station that the experimental hybrids US 625, 626 and 645 displayed remarkable immunity against *Helminthosporium turcicum* when other varieties in the same field were suffering an epiphytotic. Progress has been made in the development of synthetic varieties for south Florida and the improvement of White Tuxpan as a source of white corn for milling purposes has continued. Corneli 54 is unexcelled in the Everglades area for resistance to leaf blight and to stalk breakage caused by stalk rots.

**Red clover.** The powdery mildew resistant strain [cf. XXVIII, 175] has given lower yields than Kenland in a limited yield test.

**Lupin.** A selection made in 1954 in bitter blue lupin has been found to be resistant to *Stemphylium solani* and is being used to transfer resistance to sweet blue lines. Resistance to thrips has been found in a semisweet introduction from Germany. Selection for virus resistance in progeny from irradiated sweet yellow seed continues.

**Kenaf.** Resistance to root knot nematodes has been found in *Hibiscus eetveldianus* and amphidiploid $C_3$ progenies of *H. cannabinus* x *H. eetveldianus.* The fibre quality of the latter is poor and selection and back crossing are being carried out with a view to improving fibre quality.

Genetical studies have shown that male sterility is determined by a single recessive gene.

Field tests of susceptibility to root-knot nematodes and root-rotting fungi have been carried out and the less susceptible lines and varieties are listed.

***Sansevieria.*** Hybrid progeny from *S. trifasciata* x *S. deserti* continue to perform well and to give good yields of fibre although they sustained more damage from strong winds and heavy rain than did *S. trifasciata.*

**Tobacco.** Testing of nematode-resistant material, including interspecific hybrids, continued and most of the 109 selections gave higher yields than susceptible varieties. Other tests of disease resistance were carried out at the North Florida Station, where crosses have been made between lines resistant to *Phytophthora parasitica* var. *nicotianae* and *Peronospora tabacina.* Many $F_2$ and $F_3$ plants were resistant to both fungi.

***Capsicum.*** The resistance of PI152225 and SC46252 to tobacco etch virus has been tentatively confirmed and a further source of resistance discovered. These lines may also carry some resistance to tobacco mosaic virus and they have been crossed with four commercial varieties with a view to determining the mode of inheritance of resistance.

**Tung.** The $F_2$ hybrids of *Aleurites montana* and *A. fordii* were highly sterile and only a low percentage of fruit set was obtained in reciprocal crosses among four hybrid lines and two late blossoming varieties. The progeny from 97 controlled crosses within *A. fordii* have shown extreme variability in fruit yield and some variability in oil content.

**Peach.** A large population of seedlings from crosses among commercial varieties are now undergoing field trials but most of those from crosses made in 1956 were killed by flooding and none were really tolerant of flooding or poor drainage. None of the seedlings combine all the characteristics necessary for large-scale commercial production and further crossing has been carried out. The root knot nematode resistant strain from Okinawa has continued to perform well.

**Citrus.** A citrus tree, designated clone X, which cannot be identified as any common citrus species, is highly resistant to the burrowing nematode and reproduction of the nematodes in the root cortex is reduced.

**Mango.** Data are provided on the yield, percentage of perfect flowers, fruit set and time

to harvest of a number of varieties in the collection at the Subtropical Station.

**Groundnut.** Florida 392, a hybrid line, has given good yields with little seed damage in a three-year period although its seed quality does not equal that of Dixie Runner. Crosses have been made between Dixie Runner and Florispan Runner with a view to combining the seed quality of the former with the high yielding ability of the latter. Promising lines have already been selected.

***Rubus.*** Several $F_2$ seedlings of Regal-Ness (*R. rubrisetus* x Brilliant red raspberry) x *R. trivialis* are very promising in respect of both fruit and agronomic characters and are readily propagated.

**Blueberry.** Seedlings from hand pollinated crosses with *Vaccinium ashei* have performed well, as have ten seedlings of the northern high-bush type x *V. darrowi* which have the characteristics of tetraploids. The fruiting characteristics of these latter hybrids and other tetraploids, including a *V. ashei* x *V. darrowi* seedling, indicate that large-fruited, high quality selections, ripening in April and May, may be obtained from this material.

**Strawberry.** All progeny from crosses made in 1956 among Florida Ninety, Fla–45, Dixieland and Lassen were too late in fruiting and became infected by *Diplocarpon earliana*, although selections from earlier crosses remained free of infection. Crosses were made in 1957 between Florida Ninety or Missionary as one parent and Ambato, Dixieland, Fukuba, La–188 or Pocohontas as the second.

**Grape.** Selection 1147, from 43–47 (*Vitis smalliana*) x Caco [Catawba (*V. labrusca* x *V. vinifera*) x Concord (*V. labrusca*)] and selection 716 were more promising than 1004 and 1001 which were previously reported to be the best [XXVIII, 175]. Selection 1147 gives an agreeable purple beverage juice and is a good, though small, table grape, while selection 716 is outstanding in respect of earliness, high sugar, heavy production and freedom from symptoms of Pierce's disease. A yellow-fruited selection, 382, has given the highest sugar ratings, at 22·9% soluble solids, over a four-year period. Lake Emerald tetraploid has been crossed with several diploid lines. It has been found that scions of the French hybrid SV–12375 on Lake Emerald rootstocks produced excellent fruit at 18 months and this line has been used in extensive crossing.

**Celery.** Four related lines, EES136, EES148a, EES148b and EES148c were outstanding in respect of resistance to *Cercospora apii* and EES148b, also referred to as B56–136, is to be released as Emerald.

**Cantaloupe.** Selection for superior agronomic characters and disease resistance has given promising results and one selection, designated EE, has already reached a reasonable degree of uniformity. Others in earlier generations are still segregating but give promising individuals. Florida 27–13 shows good disease resistance and quality and is reasonably uniform but is expected to be of greater value for breeding than for release as a new variety.

**Water melon.** Isolates of *Fusarium oxysporum* f. *niveum* from various localities in the USA were tested on five varieties of water melon in the greenhouse. Charleston Gray and Fairfax were most resistant. Significant differences in pathogenicity were found but these were not correlated with either geographic origin or susceptibility of the host source.

Congo showed the greatest resistance to pure culture inoculations with *Mycosphaerella citrullina*.

**Tomato.** Differences between the colour of ripe fruits of Jefferson, STEP274 and CAStW–80–3 harvested in January and February were not found to be associated with differences in either carotene content or firmness. June-harvested fruits of Homestead showed less damage by bruising than those of other varieties although fruits of Manalucie were firmer. In the autumn-winter yield trials, GCES5 gave the highest yield of vine-ripened fruit while in the spring crop the highest yielder was an $F_1$ from a cross between this line and STEP274–1–Bk–Bk. Detailed trials are also reported from the Gulf Coast Station where in the autumn trials STEP275 and STEP278 were outstanding in the Southern Tomato Exchange Programme observational trials and GCS5, 277CAStW and GCS6 gave superior yields of top quality fruit. In the spring trials, GCS5 and GCS6 were again superior in the production of top quality fruit, together with 225–8–2–Bk CAStW, 277–$F_1$ and 159–3–4–CAStMW. In the STEP replicated trials, STEP278, Homestead–2 and STEP274 gave the highest yields of marketable fruit and in the STEP observational trials six STEP lines, 294, 288, 272, 280, 286 and 287, together with Wiltmaster, were considered best for potential yield, vine type and size and smoothness of fruit.

Bad weather prevented the release of GCS5 (CStW 80–3–Bk–1–5–Bk–BkA) [cf. XXVIII, 175]. Several selections from the 225 CAStW family are extremely promising, particularly in respect of earliness. Line 159–3–4–2–Bk

CAStMW shows the best horticultural characters of any of the tobacco mosaic-resistant stocks at present available although it is not highly resistant to concentric cracking.

**Bean.** Some progress has been made in the production of dwarf, dual-purpose and processing lines with Blue Lake type pods, of high quality, purple-podded lines for home gardens and of rust-resistant climbing beans but much of the crop was lost as the result of continuous heavy rain.

**Cowpea.** Three of the breeding lines under trial are sufficiently promising to merit consideration for release as new varieties. Line 18–17-21110 (18–20–12110) is similar in appearance to Dixielee but later, with larger pods and slightly lower yielding capacity; 16–10–210 is also similar to Dixielee but with more uniform pods; while 644210 is an improved Running Acre type. Three large seeded crowder type lines, 21–3110, 21–15–110 and 21–18–110, are also promising but have proved of especial value as sources of genes for seed size and are being used in a breeding programme aimed at breaking the linkage of the genes for small seed size and poor seed development with the gene or genes for unpigmented seed coat. Two fairly large-seeded cream lines have already been developed and the three lines are also being crossed with top bearing lines, such as 73–05110, with a view to developing lines suitable for mechanical harvesting. It is also thought that at least three new black-eye types, one of which is an exceptionally high yielder of well filled pods, are emerging from this breeding programme.

**Soya bean.** An experiment designed to determine the value of single plant data in selections from populations in which individual plants differ in height and maturity has been carried out for two years and results indicate that the performance of single plants is not a good measure of their genotype at any plant spacing up to 32 inches. "Unequal height competition" has most influence on the expression of characters but maturity differences also have some effect. Selections made in 1955 have compared favourably in performance with established varieties.

**Sweet corn.** Seneca Super Market and Woodruff 5 showed the best resistance to *Helminthosporium turcicum* in a trial at Zellwood. Eight other hybrids also showed a satisfactory degree of resistance. Lines containing the shrunken-2 factor [cf. XXVIII, 175] were found to contain 5·0% sucrose at market maturity and to retain up to 4·5% after 17 days storage at 40° F. Germination of shrunken kernels was as good as that of normal kernels under favourable conditions but poor in wet soil conditions, with differences in germinating power observed between lines. A taste panel rated ears from lines containing the shrunken-2 factor superior to both fresh and stored Golden Security even after 13 days storage at 40° F. although differences in taste were noted within lines apparently homozygous for the shrunken-2 factor.

**Washington's research progress in agriculture and home economics.** Ext. Misc. Publ. Ext. Serv., Inst. agric. Sci., St. Coll. Wash. 1958 : No. 48 : unpaginated.

242 *Harston, C. B., Morrison, K. J. & Roché, B. Report 3. Agronomy.*

**Wheat.** Semidwarf hybrid selections have outyielded Burt and Omar by more than one-third. New selections of semidwarf wheat are being made for improved winter hardiness, rapid emergence and milling quality. Protein analysis has indicated that Anniversario selections may be expected to be valuable in developing bread-type wheats for the high-rainfall area in eastern Washington.

**Barley.** Plants with desirable characters such as stiffer straw or early maturity have been induced by ionizing radiations. The selections will be tested for the stability of the changes and for yielding ability.

White Winter x TBM–305 has shown promise as a winter barley. Crosses have been made to develop two-rowed winter-hardy varieties. Crosses involving White Winter were also effected in an attempt to breed a variety similar in malting quality to Midwest varieties and with early maturity when spring sown.

243 *Dodge, J. C. & Snyder, J. C. Report 9. Horticulture.*

**Stone fruits.** Cherry and peach breeding is under way. The apricots Blenril and Earliril were introduced in 1957 [cf. XXVIII, 884].

244 Bukasov, S. M.
**(Akademician Petr Mihajlovič Žukovskij).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. : 1 36–38. [Russian].

This biography of Žukovskij, written on the occasion of his seventieth birthday, surveys his work on plant breeding and genetics and related subjects.

245 Die Kreuzung. (**Crossing**).
Saatgutwirtschaft 1958 : **10** : No. 9 : Samenfachmann 1958 : No. 9 : 65–72.
A brief and popular account is provided of the principles and methods of artificial hybridization of hermaphrodite plants.

246 Porpáczy, A.
A heterózis-nemesítés kertészeti vonatkozásai. (**Horticultural aspects of heterosis breeding**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1955 : **7** : 111–27.
Heterosis breeding results in Hungary are surveyed, the maize hybrid Martonvásár 5, polyploid beets, the hemp hybrid Kompolt B7, and diploid and tetraploid spinach being mentioned. In the discussion which followed, Gy. Mészöly described work on tomatoes at Kecskemét. Among the hybrids produced are K363 x Immun and K363 x Rajnai [Rhenish], distinguished by their earliness. S. Kovács reported that fruit improvement at Fertöd has led to increased frost resistance in *Rubus idaeus* x *R. caesius*. Among strawberries, *Fragaria vesca* x E. korai [E. Early] proved to be the best combination. E. Pap described the maize hybrid Martonvásár 5.

247 Sudnov, P. E.
**(Ways and means of practical utilization of heterosis).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 40–43. [Russian].
The writer expounds Mičurinist views on the nature of heterosis and refers to experiments with wheat, buckwheat, maize, lucerne, sainfoin and sunflower by Poliščuk, Gorina, Lubenec and Šimanskij [XXVIII, 329, 1578, 1756 and 3302] from which he infers that hybridization improves the productiveness, earliness, quality and disease resistance of pure varieties and hybrid material alike. In this connexion some proposals on mixed sowings of wheat are put forward.

248 ¿ En qué consiste la aplicación de la energía atómica en la agricultura? (**What does the application of atomic energy in agriculture consist in ?**)
Ext. Amér. 1958 : **3** : No. 3 : 26–27.
It is noted that a $\gamma$ radiation field with a cobalt 60 source, intended chiefly for the induction of mutations, has been established at the Inter-American Institute of Agricultural Science at Turrialba, Costa Rica.

249 Scarascia, G. T.
Aspetti dell'applicazione dell'energia nucleare, in agricoltura, negli stati uniti d'America. (**Aspects of the application of nuclear energy in agriculture in the USA**).
Tabacco, Roma 1958 : **62** : No. 686 : 31–45.
In describing his impressions as a member of OEEC Mission 396, the writer mentions the extensive use of radioisotopes in the USA as tracers and in induction of mutations, making special reference to researches with tobacco.

250 Filutowicz, A. & Kużdowicz, A.
Zagadnienie poliploidalności w hodowli roślin. (**The problem of polyploidy in plant breeding**).
Postępy Nauk Roln. 1954 : **1** : No. 2 : 40–56.
A review is given of methods of inducing polyploidy in plants. The effects of polyploidy on cytological, physiological, anatomical and pathological properties of plants are discussed. A section on the importance of polyploids in plant breeding and on Mičurinist views on polyploidy is included.

251 Siryckers, J.
Onderzoekingen naar de toepassingsmogelijkheden van synthetische groeistoffen als selektieve herbiciden in grasland en akkerbouwgewassen. (**Investigations on the possibilities of using synthetic growth substances as selective herbicides in grassland and agricultural crops**).
Proefschr. LandbHogesch. Gent. (undated) : Pp. 197 + F14 + L25 + A12. (Mimeographed).
Data on the susceptibility of wheat, barley, oats, maize, potato and flax varieties to MCPA, MCPB, 2.4-D and other growth substances are included.

## CEREALS

252 Thorpe, H. C. & Dixon, G. E.
**Release of new cereal varieties—1958.**
E. Afr. agric. J. 1958 : **24** : p. 15.
The following cereal varieties have been released by the Kenya Department of Agriculture:—
**Wheat.** (1) Cross 339 was developed at Njoro from 192Q2A(L) x Australian 37/254; it is beardless, white-chaffed, white-grained, of mid-

season maturity and has good straw strength. It has shown good field resistance to black stem rust but is rather susceptible to yellow rust and therefore should not be grown above 6500 ft. This variety has poor baking quality. (2) A selection from the cross Equator x 294M7C6A is designated 362B1A2. This variety, developed at Molo, is beardless, red-chaffed, red-grained, and of midseason maturity, fair straw strength and poor baking quality. It is adapted to areas above 8000 ft. and shows resistance to yellow rust but is susceptible to stem rust. (3) The variety 367AR3B2B is a selection from the cross Australian Warigo x 184P2A1F, developed at Njoro. It is beardless, white-chaffed and red-grained and has mid-season maturity, fair straw strength and fair baking quality. This wheat is recommended for areas from 6000 to 7000 ft.; it is susceptible to yellow rust but has shown good resistance to stem rust. (4) Another selection from the cross Australian Warigo x 184P2A1F is designated 367BR1D4B; it has white grain and is less resistant to yellow ear rust and possibly more resistant to black stem rust than 367AR3B2B. This variety is adapted to areas from 6000 to 6500 ft. (5) The wheat H462A–3–423 was imported from the USA, where it was developed from the cross, Fontana* x Thatcher–W38–Hope. It is an early, bearded, white-chaffed variety with red grain, moderate baking quality and straw of fair strength. In the Rongai Valley and Northern Province of Tanganyika, it has done well. During multiplication this variety showed complete resistance to stem rust but rust has now appeared on current crops in some districts. It is recommended for the 6000–7000 ft. altitudinal range. (6) The variety RL2150/A is a single-plant selection from the Canadian variety RL2150 which was derived from the cross Marquis x *Agropyron elongatum*. This midseason wheat is beardless, white-chaffed and red-grained; it has fair straw strength and good baking quality and is fairly resistant to stem rust but susceptible in the lower areas to brown leaf rust. It is recommended only for areas from 6500 to 7500 ft. (7) Sabanero/1, developed at Njoro, is a new selection of Sabanero; it is adapted to all areas where Sabanero may be grown successfully and it provides a pure source of seed.

**Barley.** Midseason Research is a selection developed in New Zealand from the parent variety Research. It has yielded well in field trials and gives better straw than Research. It is adapted to the 6000 to 9000 ft. altitudinal range; for malting purposes, the best grain is likely to be produced in the higher regions.

253 DANTUMA, G.
**Breeding wheat and barley for winterhardiness.**
Euphytica, Wageningen 1958 : **7** : 189–95.

The use of the hardening chamber and freezing chamber in testing for cold resistance at the Wageningen Foundation for Agricultural Plant Breeding, Netherlands, is outlined and some breeding results described. In wheat, cold resistance increases from the coleoptile stage to the four-leaved stage, varieties from southern Europe and North America being resistant in the coleoptile stage while varieties from north-western Europe were not. Vernalization prior to autumn sowing was useful in testing for winter hardiness in both wheat and barley. In neither crop were the winter and spring habits simply inherited. By exposing $F_1$s of spring x winter wheat to long days, an increase in the proportion of spring types was obtained. Transgressive hybridization for hardiness did not occur in winter x spring barley crosses but was found in spring x spring crosses. In wheat, crosses of winter forms with spring wheats of the transitional type, such as Peko and Reliance, gave hybrids surpassing both parents in winter hardiness. Among the wheats studied, west and north European varieties are long-day wheats with a marked vernalization requirement and good winter hardiness, while most south-east European and North American varieties combine low vernalization requirement with good winter hardiness and rapid spring development.

254 LELLEY, J.
A gabonafélék nemesítésének és a termés-eredmények gyors növelésének tudományos alapjai. (**The scientific basis of cereal breeding and of producing rapid increases in yield**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1955 : **7** : 83–94.

In this lecture given at the Hungarian Academy of Science, a programme for research is outlined and a survey of recent breeding in Hungary presented. In the discussion which followed, T. Rajháthy mentioned some wheat-rye hybrids produced at Martonvásár and some wheat-*Agropyron* hybrids. He reported that in a study of all the Triticinae, only *Agropyrum* and *Elymus* combined resistance to diseases, drought and frost with fertility and elasticity of straw.

* ? Frontana.

K. Udvaros described two methods of determining straw stiffness. The one, based on Fruwirth's method, involves spraying the standing cereal with a pasty solution, the quantity required to lodge the straw being a measure of the stiffness. In the other method, the distance of the centre of gravity of the straw from the surface of the ground is determined and expressed as a percentage of the total straw length. The closer the centre of gravity to the ground, the greater the resistance of the variety to lodging.

255 Stewart, D. M., Cotter, R. U. & Roberts, B. J.
**Physiological races of *Puccinia graminis* in the United States in 1957.**
Plant Dis. Reptr. 1958 : **42** : 881–87.

Twenty-seven races and subraces of *Puccinia graminis* var. *tritici* were identified in isolates obtained from uredial collections. Race 15B was the most prevalent, accounting for 32% of the isolates. Although the prevalence and distribution of this race were about the same as in 1956, a decided shift in prevalence of its subraces was detected. In 1956, for example, most isolates of 15B were virulent on seedlings of *Triticum durum* 'Golden Ball' whereas in 1957 this variety was resistant to most of the isolates. Race 7 of *P. graminis* var. *avenae* maintained its predominance for the eighth consecutive year. Together with the closely related race 12, it comprised 59% of the uredial isolates. Subrace 7A, capable of attacking oats with the Canadian type of resistance, expanded somewhat in distribution. A new subrace, provisionally designated 13A, was isolated from a collection made in New York State. This subrace is the most virulent culture of the pathogen now known in the USA, commercial varieties combining the Richland, Canadian and White Tartar types of resistance being susceptible.

256 Wilcoxson, R. D., Tuite, J. F. & Tucker, S.
**Urediospore germtube fusions in *Puccinia graminis*.**
Phytopathology 1958 : **48** : 358–61.

Anastomosis between germ tubes and production of fusion bodies were observed in cultures of a single race and in mixed cultures of races of the same variety or mixed cultures of different varieties on artificial media and host surfaces. Fusion bodies were however rarely found on plant surfaces. Higher osmotic concentrations of an agar medium stimulated the production of fusion bodies. Nuclei were observed within the fusion bodies, indicating the possibility of combination of nuclei from different sources.

257 Caldwell, R. M. *et al.*
**Small grain varieties for Indiana. Recommendations for 1958 and performance, 1953–57.**
Res. Bull. Purdue Univ. 1958 : No. 658 : Pp. 20.

The results of trials of varieties of soft red winter wheat, spring and winter oats, winter barley and winter rye are summarized.

## WHEAT

258 **(The senior plant breeder).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 39–40. [Russian].

Mention is made of some of the wheat varieties bred by V. E. Pisarev, who has recently celebrated his seventy-fifth birthday. Some of his recent wheat-rye amphidiploids are characterized by a high protein content [cf. XXVIII, 281].

259 Nishio, K. & Nakagawa, M.
**(Studies on the growth habit of wheat varieties. I. The genes controlling erect and procumbent types in wheat).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 191–97. [Japanese].

The genetics of growth habit was studied in the $F_1$–$F_2$ of ten crosses involving a series of Japanese and American varieties. Three loci are believed to be concerned, epistatic in the order $E > P > I$; multiple alleles are postulated at each locus. $E$ determines erect habit, $P$ and $I$ procumbent habit. Early heading and maturation are associated with erect habit. The genotypes of the varieties studied are given as follows: Shinchunaga [Shinchu Long], *EEpptt*; Norin 20 [Ministry of Agriculture and Forestry 20], $E_1E_1pptt$; Shirasaya 1 [White Pod 1], $eeP_1P_1T_2T_2$; Ardito, $eeP_2P_2T_1T_1$; Wichita, $eePPT_1T_1$; Ceres, $eeP_1P_1TT$; Pawnee, *eePPTT*; Norin 8, *eePPTT*; and Oinoue, *eePPTT*.

260 Nishio, K. & Nakagawa, M.
**(Studies on the growth habit of wheat varieties. II. A comparison between the sensitivity to temperature and light of erect and procumbent types of wheat).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 23–27. [Japanese].

The same varieties were used as in the first paper [259]. These were grown under four sets of conditions: (1) in the open with natural

photoperiods, (2) in the open under long photoperiods, (3) in the open under short photoperiods, and (4) in the greenhouse under natural photoperiods. The expression of gene *E* was not affected by temperature or photoperiod; the expression of *P* was markedly affected by temperature while *I* was sensitive to photoperiod. In the latter two cases, both habit and heading date were affected.

261 Nuove promesse sui frumenti duri. (**New promise among the hard wheats**).
G. Agric. 1958 : **68** : p. 232.

A brief description is given of a series of hybrids made by C. Maliani by crossing the wheat Roberto Forlani, itself a hybrid of Villa Glori with *Triticum turgidum* [cf. XXVI, 3166], with a number of cultivars of *T. durum*. The hybrids were relatively fertile and a wide range of types segregated in the $F_2$. From these the short forms of the *T. durum* type were selected and the $F_5$ contains some promising lines with much higher yielding capacity than that of the cultivars of *T. durum* now grown in Italy.

262 Kiričenko, F. J.
(**The principal results of the work on developing hard winter wheats**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 21–28. [Russian].

This account on breeding hard winter wheats at the All-Union Breeding and Genetics Institute is substantially the same as that included in a previous report [XXVII, 2695]. It is mentioned in addition that the offspring of Odessa 3 x mixed pollen of hard winter wheats is very winter hardy. In 1957 one family from the above cross yielded 28·9 c. per ha. as compared to 29·6 c. of Kooperatorka and 31·8 c. of Odessa 3.

263 Simonet, M.
Étude descriptive de l'hybride amphidiploïde *Aegilotricum ventricoccoides* nobis (*Aegilops ventricosa* x *Triticum dicoccoides*).
[**A descriptive study of the amphidiploid hybrid *Ae. ventricoccoides* nobis (*Ae. ventricosa* x *T. dicoccoides*)**].
Ann. Sci. nat. 1957 : **18** : 1–26.

The amphidiploid, *Ae. ventricoccoides* [cf. XXVII, 1502] is compared in detail with both parents, special attention being paid to morphological characters. About 70 characters were studied and it was found that about equal numbers of *Aegilops* and *Triticum* characters were dominant in the hybrid; many intermediate characters were also noted. There was some transgression; for example, the ears of the amphidiploid were longer and more solid than those of the parents and the weight of the grain was greater.
The amphidiploid was resistant to *Cercosporella herpotrichoides* and susceptible to *Puccinia triticina*; since *Ae. ventricoccoides* may be crossed with *T. vulgare*, it would be possible to combine resistance to both these pathogens.

264 Tozu, T.
(**A wheat mutation affecting crossability with rye**).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 228–30. [Japanese].

The Japanese variety Nishimura crosses well (up to 74·6% crossability) with rye. One line of this variety however was found to cross poorly (0–3·8% crossability) and hybridization experiments between this line and the typical variety showed that a single gene difference was involved. The low crossability of the anomalous line (designated Nishimurakawari [Nishimura Mutant]) is dominant to high crossability, the gene concerned being designated *C*.

265 Salzmünder Bartweizen. (**Salzmünde Bearded wheat**).
Dtsch. Landw., Berl. 1958 : **9** : p. 204.

This medium-early bearded variety is a rye-wheat hybrid which is particularly winter hardy and resistant to lodging. It is suitable for all wheat-growing soils, lighter soils and dry areas in mountainous regions. It is stated to have field resistance to *Puccinia triticina*, moderate resistance to *P. glumarum* and varying resistance to powdery mildew. The variety is suitable for combine harvesting.

266 Nakajima, G.
**Cytogenetical studies on the intergeneric $F_1$ hybrids raised between Emmer wheat and two species of *Secale*.**
Japan. J. Bot. 1958 : **16** : 61–85.

The author describes the results of his investigations on crosses of *Triticum durum*, *T. turgidum* *T. dicoccum*, *T. polonicum* and *T. pyramidale* as ♀ parents with *S. africanum* and *S. montanum*. When pollinated by either species of *Secale*, *T. durum* had the highest percentage of seed setting and *T. polonicum* and *T. dicoccum* the lowest. The percentage of $F_1$ plants obtained, expressed on the basis of number of flowers pollinated, was slightly higher in combinations with *S. montanum* than in those with *S. africanum*. In general, although the $F_1$ plants possessed morphological characteristics of both parents,

they resembled the ♂ parents more closely. When ripening, the spikelets of all $F_1$ plants became brittle, as in the *Secale* parents. All the hybrids set seed, *T. durum* x *S. africanum* showing the highest fertility (68·76%) and *T. durum* x *S. montanum* the lowest (0·32%). In general, seed fertility of the $F_2$ hybrids was much higher in combinations with *S. africanum* than with *S. montanum*. All the hybrids had $2n = 21$. The number of bivalents at metaphase I varied from 0–3 to 0–7, according to the cross. In some hybrids the univalents tended to lie on the equatorial plants at metaphase I, instead of being scattered on the spindle. The percentage of cells with univalents on the equatorial plate ranged from 14·47 in *T. durum* x *S. africanum* to 50·97 in *T. turgidum* x *S. montanum*. Data already published on hybrids of *T. persicum* with *S. africanum* and *S. montanum* are incorporated in this report [cf. XXVII, 380].

267 Bjurman, B.
**Note on the frequency of univalents in some strains of *Triticale* and their hybrids.**
Hereditas, Lund 1958 : **44** : 189–92.

The material studied consisted of (1) *Triticale* A and C ($2n = 56$), (2) their $F_1$ hybrid and (3) a uniform recombination product derived from a cross between A and C. Strain A had a higher frequency of univalents than C in each year. Hybrids between the two strains had higher frequencies than both parents. These observations confirmed those reported by Müntzing for the same strains [cf. X, 107]. Meiosis was less irregular in (3) than in (2), the univalent frequency being of the same magnitude as in A.

268 Riley, R. & Chapman, V.
**The production and phenotypes of wheat-rye chromosome addition lines.**
Heredity 1958 : **12** : 301–15.

Plants disomic for one of four chromosomes of rye and containing the full complement of wheat chromosomes were produced in the following way at the Plant Breeding Institute, Cambridge, England. A plant derived from the cross of a polyhaploid ($2n = 28$) of *Triticum vulgare* 'Holdfast' x *Secale cereale* 'King II' with Holdfast had $2n = 49$ (42 wheat + 7 rye chromosomes). Plants with 42 wheat chromosomes + 1 pair from rye were obtained by selfing the heptaploid and by crossing it with wheat and selfing 43-chromosome individuals. Each pair of rye chromosomes resulted in a marked and distinctive modification of the phenotype of Holdfast. Most of the modifications were of a quantitative nature. Chromosome III had a narrowing effect on all the organs whereas the genes in the other three chromosomes altered the dimensions of only a limited number of organs. Among the qualitative changes were the following, the numerals referring to the rye chromosome responsible: hairy neck, I; red grain, II and IV; resistance to *Erysiphe graminis*, II or III; resistance to *Puccinia glumarum*, II; purple straw, III or IV; and branched ears and supernumerary spikelets, IV. Each of the four rye chromosomes was readily distinguishable from the others morphologically at anaphase I. Chromosome I had a short arm and one extremely long arm with a secondary constriction mid-way along it. In II, one arm was over twice the length of the other, the short arm having a pronounced secondary constriction which marked off a large satellite. Both arms were more or less equal in length in III. Chromosome IV had arms of unequal length and could be distinguished from II by the greater length of the short arm relative to the long one and by the smallness of the satellite carried by the short arm. Monosomics were only considered in so far as they differed from disomics. Among the differences noted were lower degree of resistance to *E. graminis* in the monosomic addition of II and absence of branched ears and supernumerary spikelets in the monosomic addition of IV.

269 Pisarev, V. E. & Žilkina, M. D.
**(Application of boron in breeding hybrids of low fertility).**
Bjull. naučn.-teh. Inform. naučn.-issled. Inst. Zemled. centr. Rajon. nečernozemn. Polosy (Bull. sci.-tech. Inform. agric. res. Inst. centr. Regions nonchernozem Belt). 1956 : No. 1 : 20–23. [Russian].

Many amphidiploids obtained from wide crosses in wheat failed to show the expected high degree of fertility and produced less than 20 grains per ear. When the plants were watered with a 0·05% solution of boric acid the number of spikelets per ear and the number of grains were often increased. Thus in the triple hybrid (*Triticum monococcum* x *T. persicum*) x *T. vulgare*, the number of grains per ear was raised from 1·4 to 41·3 and in a rye x wheat amphidiploid from 7–17 to 39–67. By applying boric acid in a succession of generations and selecting for fertility the average number of grains per ear in this hybrid was raised to over 90, the improvement being maintained after the boron

applications were discontinued. The grains were also plumper and smoother.

270 Lapčenko, G. D.
**(The winter wheat - *Agropyron* hybrids 599 and 186).**
Bjull. naučn.-teh. Inform. naučn.-issled. Inst. Zemled. centr. Rajon. nečernozemn. Polosy (Bull. sci.-tech. Inform. agric. res. Inst. centr. Regions nonchernozem Belt). 1956 : No. 1 : 14–19. [Russian].

Some data are given on the characteristics of these two hybrids [cf. XXVI, 286] and results obtained with them in the Moscow area during the period 1944–55. Hybrid 599 gave a mean yield of 38·3 c. per ha., exceeding the standard variety Moscow 2453 by 4·9 c. In the period 1946–55 hybrid 186 gave a mean yield of 43·5 c. per ha., exceeding Moscow 2453 by 7·8 c.

271 Andreev, L. N.
**(Influence of rust attack on photosynthesis and the water relations in *Triticum-Agropyron* hybrids).**
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1958 : No. 30 : 66–71. [Russian].

Hybrids 1, 186 and 599 when infected slightly with *Puccinia glumarum* or *P. triticina* increased their photosynthetic activity and rate of transpiration; with severe infections the photosynthetic activity was reduced.

272 Schiemann, E. & Staudt, G.
*Triticum* x *dimococcum*, ein Amphidiploid mit den Genomen AA AA BB. **(T. x *dimococcum*, an amphidiploid with the genomes AA AA BB).**
Züchter 1958 : **28** : 166–84.

Amphidiploids with the chromosome number $2n = 42$ were obtained by colchicine treatment of the cross *T. monococcum* x *T. dicocccum* and its reciprocal at Berlin-Dahlem, Germany. Detailed descriptions are provided of the amphidiploid and of the parent species. The hybrid is intermediate in form between its parents but tends to resemble *T. dicoccum* more than *T. monococcum*; of 27 characters studied, 13 from *T. dicoccum* were dominant in the amphidiploid. The latter showed spontaneous breaking of the ear axis, which does not occur in either parent. A possible mode of inheritance involving two complementary genes is suggested for this character.

The hypothesis of Bertsch [cf. XX, 1534] that *T. compactum* arose from a cross between *T. dicococcum* and *T. monococcum* is contested. The amphidiploid described differs markedly in form from *T. compactum*; it does not have the type of ear which characterizes *T. compactum* and which is determined by gene *C* in the D genome. The amphidiploid also lacks all the characters specific for hexaploid wheat and it therefore does not contain the D genome, which is thought to have come from *Aegilops*.

Other questions of the relationship between tetraploid and hexaploid wheats are also discussed.

273 Watanabe, Y., Mukade, K. & Kokubun, K.
**(Studies on the production of amphidiploids as a source of resistance to leaf rust in wheat. IV. Cytogenetical studies on the $F_1$ and amphidiploid of *Triticum Timopheevi* Zhuk. x *Aegilops comosa* Sibth. et Sm.).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 169–74. [Japanese].

The modal meiotic configuration of the $F_1$ hybrid was $1_{II} + 19_I$, followed closely by $21_I$. By colchicine treatment, amphidiploids and two aneuploids ($2n = 41$ and 43) were obtained. The modal chromosome configuration of the amphidiploids was $21_{II}$ but a quadrivalent was frequently encountered. The amphidiploid is intermediate morphologically between the parents and is immune to many races of *Puccinia triticina*. It crosses successfully with *T. timopheevi*, *T. vulgare*, *T. compactum*, *T. spelta*, *T. sphaerococcum*, *T. macha* and *Secale cereale*. [Cf. XXVII, 2767].

274 Koedžikov, H.
**(An experiment on vegetative hybridization with wheat).**
Naučn. Trud. (Sci. Trans.) Minist. Zemed., Sofija : Ser. Rastenievădstvo (Pl.-Industr.) : 1954 : **2** : 69–77. [Bulgarian].

Heritable changes in *Triticum spelta* are reported after grafting it on *T. vulgare* var. *lutescens*. In the $F_1$ these comprised modifications in leaf colour, amount of waxy bloom, elasticity of rachis and the mode of emergence of the grain from the glumes. The changes in the $F_2$ included modifications in the shape and colour of the ear and among the segregates were productive soft wheat forms pertaining to var. *erythrospermum*.

275 Pisarenko, G. S.
**(A description of seed production of winter wheat grown at varied altitudes in the Kabarda-Balkar ASSR).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958: No. 1: 32–36. [Russian].

Tabulated information, showing that progenies

of Novoukrainka 83 and Osetian 3 raised from grain obtained at 200 m. above the sea are superior to those grown on higher ground, is presented.

276 Ukolov, A. A.
**(The winter wheat variety Moskovskaja 2453).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 49–52. [Russian].

The yield of Moscow 2453 has been improved by intervarietal open pollination with unspecified varieties of winter wheat, including some standard varieties for the Moscow province at the Timirjazev Breeding and Genetics Research Station. For three years the improved variety has outyielded the initial form on the average by 0·4–4·4 c. per ha. and the standard variety PPG599 by 1·0–3·3 c. per ha. It also develops a greater number of grains per ear, a higher percentage of vitreous grains, and has a higher 1000-kernel weight. Its gluten content has risen by 1·0–1·5%

277 Kleinwanzlebener Winterweizen "Frio." **(Kleinwanzleben winter wheat Frio).**
Dtsch. Landw., Berl. 1958 : **9** : p. 204.

Frio originated from the cross Hadmerslebener IV x (Marquis x Kronen). Its noteworthy characters are winter hardiness, resistance to lodging, and low susceptibility to *Puccinia triticina* and *P. glumarum*. In certain parts of the German Democratic Republic, Frio has given high yields of grain and good quality straw. Late sowing dates up to the middle of November are tolerated and this variety makes good use of fertilizer applied at high rates; it is suitable for combine harvesting.

278 Heyne, E. G.
**Registration of improved wheat varieties, XXI.**
Agron. J. 1958 : **50** : 396–99.

Descriptions are given of eleven wheats, which have been registered by the US Department of Agriculture in cooperation with the American Society of Agronomy: Atlas 50 and Atlas 66 [XXI, 1771]; Dual [XXVI, 1170]; Knox [XXIV, 2761]; LaPorte [XXVIII, 1505]; Vermillion [XXVI, 1170]; Vigo [XVIII, 851]; Bledsoe; Chancellor [XVIII, 1350]; Butler [XX, 30]; and Seneca [XXI, 938]. Parentages not previously given in earlier abstracts covering these varieties are as follows. Dual was developed from a series of seven crosses involving as primary parents Fultz sel. CI11512, Hungarian, Hope, Hussar, W38, Trumbull, Wabash and Fairfield. LaPorte resulted from a series of five crosses, with Hope, Hussar, Trumbull, Fultz sel. CI11845, Fulhio and Purkof as primary parents. Knox and Vermillion were bred from the same series of six crosses, involving Chinese CI6223, Michigan Amber B45, Minhardi, Wabash, Purplestraw, Fultz sel. CI11512, and Trumbull. Chancellor was derived from (Dietz-Carina x Carina-Mediterranean) x Kansas 1068-Purplestraw[3] and Seneca from Fulcaster x Portage.

The soft red wheat Bledsoe was developed at the Georgia Coastal Plain Experiment Station from [(Frondosa x Redhart 3 - Noll) x Purplestraw[3]] x [(S990 x Illinois 1 W38 - Hope) x Purplestraw]. It is medium-early in maturity, with semiwinter habit, resistance to the prevalent races of leaf and stem rust and to soil-borne mosaic, and moderate resistance to mildew. In trials in Georgia it has outyielded Chancellor, Atlas 50, Coker 47–27 and Coastal. It is slightly higher in protein content than Chancellor.

279 Saura, F.
El índice meiótico de trigos argentinos y su valor fitotécnico. **(The meiotic index of Argentine wheats and its breeding value).**
Rev. Fac. Agron. B. Aires 1957 : **14** : 76–84.

Among 31 varieties studied, 25 had a meiotic index, i.e. percentage of normal tetrads, of 91–100. In other varieties the index fell to 30. Abnormalities included laggards and extra cells. Varieties with an index lower than 90 are considered unstable and unsuitable for genetical work or breeding.

280 Cybul'ko, V. S.
**(Increasing the depth of the tillering node in winter wheat by means of selection).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 2 : 15–21. [Russian].

Ukrainian experiments showed that heritable differences in the depth of the tillering node existed within a variety, greater depth being positively correlated with improved rooting, tillering and overwintering capacity. Forms of Odessa 3, Lutescens 17 and Har'kov 4 which form the tillering node deeper in the ground than other plants of these varieties were selected.

281 Phillipp, L.
Messung des Kornausfalles bei Weizen mit der Ährenzentrifuge. **(Measurement of grain shedding in wheat with the ear centrifuge).**
Z. Acker- u. PflBau. 1958 : **106** : 153–72.

A brief survey is presented of the genetically

determined factors which affect the shedding of wheat grain. Experimental details are provided of a procedure used in measuring shedding tendencies by means of a centrifuge. A series of German winter wheats were tested by this method and varietal differences were found; these showed a general similarity to estimations of shedding based on observations in the field.

282 Varenica, E. T.
**(Using selective fertilization in breeding winter wheat).**
Bjull. naučn.-teh. Inform. naučn.-issled. Inst. Zemled. centr. Rajon. nečernozemn. Polosy (Bull. sci.-tech. Inform. agric. res. Inst. centr. Regions nonchernozem Belt). 1956 : No. 1 : 5–9. [Russian].
[Cf. XXVII, 408].

283 Strusi, A.
Contributo alla conoscenza della costituzione glutinica del frumento duro e del frumento tenero. **(A contribution to the knowledge of the gluten constitution of hard and soft wheats).**
Ann. Sper. agr. 1958 : **12** : 833–53.
Examinations by paper chromatography have shown the composition of the aminoacids to be the same in gluten from *Triticum durum* and *T. aestivum*. Partial hydrolysis with trypsin however gave rise to different groups of peptones, indicating a different arrangement of the aminoacids in the molecule. This probably accounts for the different physical properties of the glutens from the two species.

284 Ryžej, I. P.
**(The productiveness of florets in wheat ears in connexion with the time of flowering).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 1 : 8–10. [Russian]
Data showing the weight of grains borne in an ear and the individual weights of grain formed in the successive florets of the spikelets of different winter-wheat varieties at the Kirgiz Agricultural Institute are presented. The tabulated information indicates that the largest grains in an ear are formed in the earliest flowering florets.

285 Kizima, P. N.
**(Macaroni properties of hard wheat varieties).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 47–53. [Russian].
Hordeiforme 432, Hordeiforme 5866, Don Garnovka 672, Rostov 23, Arnautka Nemerčanskaja [Nemerčansk Albanian], Akmolinka 5 [wheat from Akmolinsk 5], Melanopus 37, Melanopus 69, Melanopus 1387, Melanopus 1932, Narodnaja [People's], Palestinka 6 [wheat from Palestine 6], Sary-Bugda [Yellow wheat] and Coerulescens 4068 had the finest macaroni properties among many varieties tested. It was found that the macaroni quality of a variety changed when the variety was grown under different climatic and soil conditions.

286 Kamal, M. A. M., Naguib, M. I. & Refai, F. Y.
**Carbohydrate fractions in different varieties of Egyptian wheat kernels with reference to the influence of some fertilizer treatments and locations.**
Ann. agric. Sci., Cairo 1956 : **1** : No. 2 : 95–110.
Variation in the different carbohydrate fractions of four Egyptian wheat varieties is discussed. Highest total soluble carbohydrates was found in Baladi [Local] while values for hexosans, total polysaccharides and total carbohydrates are highest in Giza 139.

287 Kamal, M. A. M., Refai, F. Y. & Naguib, M. I.
**Study on the effect of certain fertilizer treatments on the biochemical constituents of Egyptian wheat kernels varieties. Effect on the nitrogen content and gluten quality with reference to the weight of kernels.**
Ann. Agric. Sci., Cairo 1956 : **1** : No. 2 : 127–44.
Four Egyptian wheat varieties were studied with regard to variation in nitrogen content and gluten quality. Total-nitrogen and protein-nitrogen values show parallel varietal differences, Giza 139 giving the highest yield of each, and there are indications of significant interactions between fertilizer treatments and varieties. Gluten quality was best in Baladi [Local].

288 Kamal, M. A. M., Refai, F. Y. & Gawad, S. A.
**Crystalloid nitrogen fractions in the different varieties of Egyptian wheats.**
Ann. agric. Sci., Cairo 1957 : **2** : No. 1 : 259–72.
The wheat varieties Hindi D, Giza 139, Toussoun and Baladi [Local], grown in different locations with different fertilizer treatments, were studied for variations in the different nitrogen fractions.

Significant varietal differences in amine nitrogen content were found, this being markedly high in Baladi.

289 Bruner, G. H., Sibbitt, L. D. & Harris, R. H.
**A new procedure for screening nursery wheat samples for milling quality.**
Proc. N. Dak. Acad. Sci. 1957 : **11** : 59–60.

Correlation coefficients higher than 0·90 were found between flour volume and wheat - meal volume, indicating that the latter value should be as useful as the former for assaying milling quality. This was confirmed by the high negative correlations between flour yield on the one hand and flour and wheat-meal volume on the other (— 0·81 and — 0·79 respectively).

290 Avila, A.
Microtécnica para extracción y valoración de la calidad de gluten en un grano de trigo. (**Microtechnique for the extraction and evaluation of the gluten quality of a grain of wheat**).
Rev. Invest. agric. B. Aires 1958 : **12** : 57–72.

In the method described, the endosperm of the single grain is cut away, leaving sufficient attached to the embryo to allow the latter to germinate and grow normally. The separated endosperm is pounded in a mortar with a few drops of water to extract the gluten, which is then squeezed dry between two slides and weighed. It is then dispersed in 1·5 cc. of N/50 lactic acid solution and the dispersion read in a nephelometer. The index of dispersion is given by the formula

$$\frac{\text{quantity of dispersed gluten (mg.)} \times 100}{\text{weight of wet gluten (mg.)}}$$

A high value is obtained for varieties with weak gluten and a low for those with strong gluten, the intervarietal differences being highly significant.

291 Whitehouse, R. N. H., Thompson, J. B. & Valle Ribeiro, M. A. M. do
**Studies on the breeding of self-pollinating cereals. 2. The use of a diallel cross analysis in yield prediction.**
Euphytica, Wageningen 1958 : **7** : 147–69.

"The behaviour of 19 varieties of spring wheat under different environmental conditions is discussed in terms of the following five characters: weight per grain, grains per spikelet, spikelets per ear, ears per plant and yield of grain per plant. The first four of these characters (the components of yield) are shown by correlation analyses to be largely independent of each other.

"Four varieties, chosen because they each showed extreme values of one or more of the components of yield, were crossed in all possible combinations. The $F_1$ and $F_2$ of this diallel set of crosses was analysed for each character according to the method of Jinks and Hayman. The results are discussed in relation to crop improvement and predictions are made for each character as to which cross or crosses are likely to be most profitable for the breeder. The future handling of this material in order to test these predictions is outlined." [Cf. XXVIII, 1461]. [Authors' summary].

292 Andrews, J. E.
**Controlled low temperature tests of sprouted seeds as a measure of cold hardiness of winter wheat varieties.**
Canad. J. Pl. Sci. 1958 : **38** : 1–7.

Freezing tests of sprouted grains of winter wheat varieties carried out on a laboratory scale have been compared with field tests as a means of testing for cold hardiness. A high degree of correspondence between these results indicates the validity of the method.

293 Zalov, M. K.
(**The hard winter wheats of Dagestan as initial material in breeding**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 65–66. [Russian].

A collection of Dagestan wheats was tested in local spring and autumn sowings. Spring sowing served to detect true winter forms and autumnal sowing forms which overwinter well. The hardiest forms occurred among *apulicum* and *niloticum* forms of hard wheat originating from Sergokala, Kajtag and Kasumkent, which have the lowest winter temperatures in Dagestan. These are regarded as valuable for breeding purposes.

294 Šulyndin, A. F.
[**The formation of the character of winter hardiness by plants of interspecific wheat hybrids (*Triticum vulgare* x *T. durum*)**].
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1958: **19** : 108–20. [Russian].

An extended account of a report already summarized is given [XXVII, 1645]. Supplementary information includes observations on the relations between hardiness on the one hand, and mode of crossing, synthesis of sugars and

nitrogen, and the duration of the vernalization phase, on the other. The best new hard winter wheat lines overwintered well in Herson under the severe conditions of the winter of 1955–56.

295 NAKAGAWA, M.
**(Genetical studies on the resistance of wheat to waterlogging. I. The genes responsible for resistance to waterlogging).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 198–200. [Japanese].

The genetics of resistance was studied in the $F_0$–$F_2$ of five crosses involving six varieties. Resistance was found to depend on the loci, *C* and *N*; *CN* plants are susceptible to waterlogging while *Cn* and *cN* and *cn* plants are resistant. Varieties Norin 20 [Ministry of Agriculture and Forestry 20] and Shinchunaga [Shinchu Long] have the genotype *CCnn*, while Toyamawase [Toyama Early], Iyo, Shirasaya 1 [White Pod 1] and Pawnee have the genotype *ccNN*.

296 NAKAGAWA, M.
**(Studies on the resistance of wheat varieties to *Gibberella zeae*. IV. The relation between susceptibility to *G. zeae*, injury by potassium chlorate to the seedlings and fructose content).**
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 49–53. [Japanese].
[Cf. XXVII, 429].

297 NAKAGAWA, M.
**(Studies on the resistance of wheat varieties to *Gibberella zeae*. V. The relation between susceptibility to *G. zeae*, rate of decolorization of methylene blue, and glucose content).**
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 54–57. [Japanese].
[Cf. XXVII, 430].

298 NAKAGAWA, M.
**(Studies on the resistance of wheat varieties to *Gibberella zeae*. VI. The relation between susceptibility to *G. zeae*. and phosphate content).**
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 58–60. [Japanese].
[Cf. XXVII, 2814].

299 NAKAGAWA, M.
**(Studies on the resistance of wheat varieties to *Gibberella zeae*. VII. Relations between substances characterizing susceptibility of wheat varieties to *G. zeae*, genes and enzymes).**
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 61–68. [Japanese].
[Cf. XXVIII, 322]

300 BOCKMANN, H.
Untersuchungen über die Braunfleckigkeit des Weizens im Sommer 1957.
**(Investigations on *Leptosphaeria nodorum* on wheat in the summer of 1957).**
Phytopath. Z. 1958 : **33** : 225–40.

A method is described for judging the degree of infection of wheat with *Septoria* (*Leptosphaeria*) *nodorum*; the infected ears are submerged in water for two to three hours and the quantity of spores collecting on the surface of the water is measured. This procedure facilitates the estimation of the infection of brown-eared varieties and is also useful for judging late infection, when other symptoms may not be clearly expressed. A collection of winter wheats was investigated at Kitzeberg, Germany, and some indication of varietal resistance to *L. nodorum* was found. Factors affecting infection by *L. nodorum* and other aspects of its epidemiology were also studied.

301 TAYLOR, D. K.
**The nature and relationship of bunt resistance in a hard red winter wheat selection and certain tester varieties.**
Diss. Abstr. 1958 : **18** : Publ. No. 25,065 : p. 19. (Abst.)

Selection 191 Red, of uncertain origin, was resistant to 21 races of *Tilletia caries* and *T. foetida*, intermediate in resistance to race L–1 and susceptible to T–11, T–13 and L–9. The $F_2$ and $F_3$ of crosses of 191 Red with Ridit and Brevor failed to segregate for reaction, when inoculated with T–10. The three varieties therefore possessed at least one factor in common for resistance to this race. Inheritance of bunt resistance in 191 Red was conditioned by two major factors, one recessive and the other intermediate. The latter factor allowed about 50% of the heterozygous plants to become susceptible and provided resistance to T–7, T–10, T–16 and possibly T–14. The recessive gene determined resistance to L–8, T–10 and T–15. When $F_3$ lines of 191 Red x Hussar

were inoculated with T–10 and T–14, segregation was so limited that close linkage between the intermediate factor of 191 Red and *H* in Hussar appeared to be operative. Evidence was obtained of another factor in Hussar, in addition to the two already known to occur, which appeared to be responsible for resistance to T–7 and T–11. Data showing that Hohenheimer carried one major dominant gene for resistance to T–11 confirmed the result of Gaines and Smith. A recessive or intermediate factor governed the resistance of Brevor to T–11 and T–13.

302 Király, Z.
Búzafajták rozsdaellenálló-képességének vizsgálata három évi kísérletek alapján. **(Three years' experiments on the rust resistance of wheat varieties).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1955 : **8** : 170–71.

The rust resistance of 80 winter wheats and 21 spring varieties was studied at Martonvásár and Kompolt, Hungary. Aniversario [Anniversary], Buck Sarmiento, Newthatch, Pilot, Mida, Redman, *Triticum timopheevi* and *T. persicum* were resistant to both *Puccinia graminis* and *P. triticina*. Thatcher, Ceres, Renown, Regent and Cometa were resistant to *P. graminis* only and Tenmarq was moderately resistant. Kawvale, Vigo, Fulcaster, Virgilio, Ainta and Barletta were resistant to *P. triticina* only. Newthatch, Pilot, Mida and Redman were also resistant to bunt.

303 Thorpe, H. C. & Dixon, G. E.
**Wheat breeding and the development of the Plant Breeding Station.**
Kenya Frmr. 1958 : 21–22.

The history and work of the Plant Breeding Station at Njoro, Kenya is briefly described, special mention being made of breeding for resistance to stem rust in wheat.

304 Papp, Zs.
Búzanemesítés—fajtahasználat. **(Breeding of wheat—utilization of varieties).**
Agrártudomány 1958 : **10** : No. 4: 15–22.

Hungarian varieties bred since the 1873 rust epidemic are noted. Among the newer varieties which have shown promise in preliminary trials, Kompolt 169 and Fertöd 293, intended to replace the popular current varieties F481 and B1201 respectively, surpass the older wheats in resistance to lodging and rusts. Like B1201, Fertöd 293 requires fertile soils.

305 Freitas, A. P. do C. e
*Puccinia rubigo-vera tritici*—IV. Raças fisiológicas isoladas em Portugal em 1955 e grau de resistência, em plantas jóvens, de alguns trigos. **(*P. rubigo-vera tritici*. IV. Physiological races isolated in Portugal in 1955 and degree of resistance in young plants of some wheat varieties).**
Agron. lusit. 1957 : **19** : 233–50.

Races 11, 68, 75, 78, 87 and 143 were identified, the most prevalent being 11 and 75. In a study of 279 cultivars, the results of which are presented, those distinguished by resistance included *Triticum aestivum* 'Bárbaro', 'Castilla 3' and 'Frontana', *T. durum* 'Hamira AC5', *T. pyramidale* 'Egipto' and *T. dicoccum* '2127' in addition to *T. monococcum*.

306 Green, G. J.
**Resistant varieties, best answer to wheat rust problems.**
Res. Frmrs., Ottawa 1958 : **3** : No. 3 : 3–4.

After discussing the problems raised in Canada by the appearance of new rust races and by changes in the prevalence of races the author mentions the sources of resistance now known and the need for the continued use of new types of resistance.

307 Geis, J. R., Futrell, M. C. & Garrett, W. N.
**A method for inoculating single wheat leaves with more than one race of *Puccinia graminis* f. sp. *tritici*.**
Phytopathology 1958 : **48** : 387–88.

The following method of "patch inoculation" has been found to be particularly useful for testing $F_1$ and $F_2$ plants. "The materials used are $\frac{1}{8}$ in. squares of filter paper and 3 in. x $\frac{1}{2}$ in. pieces of Cellophane tape. To facilitate handling the patch, both ends of the tape are folded back from a crease made in the centre. With these materials a patch inoculation is made as follows: Immerse the filter paper in a water suspension of spores, remove, affix to Cellophane tape near the centre crease, and position over the spot on the leaf where infection is desired. Press the tape lightly but firmly together around both sides of the leaf so that the filter paper makes full contact with the leaf surface. It apparently makes no differences whether the filter paper is on the upper or lower surface of the leaf. The area of the leaf to be inoculated should first be marked with India ink or other waterproof material."

308 Bromfield, K. R.
**The effect of temperature on seedling reaction of selected wheat varieties to *Puccinia graminis tritici*.**
Diss. Abstr. 1958 : **18** : Publ. No. 23,926 : p. 20. (Abst.)
A summary is given of the results of tests carried out on the reactions of 87 varieties to several races at different temperatures and of additional tests on varieties found to be temperature-sensitive.

## BUCKWHEAT

309 Krutenko, E. G.
**(A valuable method for improving the productiveness of buckwheat seed).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 61–63. [Russian].
Mechanical mixtures of the seed of the same variety but obtained from crops grown under varied environments gave rise to more productive progeny than the highest yielding component in experiments at Odessa. The highest yield increase was obtained in the variety Bogatyr' [Hero]: 4·2 c per ha.

310 Giacomini, V.
Notizie e ricerche sul genere *Fagopyrum* Gaertn. I–III. **(Information and research on the genus *Fagopyrum* Gaertn. I–III).**
Atti Ist. bot. Univ. Pavia : Ser. 5 : 1955 : **13** : 245–98.
The first article deals with the history of the cultivation of *F. tataricum* in the Valtellina. The second is a historical survey of the cultivation of *F. sagittatum* in Europe in general and Italy in particular. The third describes the botanical varieties of the cultivated species of *Fagopyrum* with special reference to Italian cultivars.

311 Mansurova, V. V., Saharov, V. V. & Hvostova, V. V.
**(The sensitivity of diploid and autotetraploid plants to gamma radiation).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 989–97. [Russian].
Dry seeds of the buckwheat Bol'ševik, with $2n = 16$, and its autopolyploid with $2n = 32$ were irradiated with doses of 10, 15, 20 and 30 kr. from $Co^{60}$. The diploids showed a greater reduction in germinating capacity from the highest doses and in all doses their growth was more retarded than that of the tetraploids. The same difference was observed between diploid and autotetraploid forms of the millet Dolinskoe.
Tetraploid buckwheat not infrequently has light-green spots on the leaves, thought to be composed of diploid tissue; their proportion was not increased by irradiation, whereas the diploids, which in the control plants were without spots at all, formed spots in the irradiated plants, the amount gradually increasing with the dose of irradiation; these spots are thought to be caused by damage to the nuclei.

312 Sugawara, K.
**(On female sterility in buckwheat, in particular, the relation between pistil growth and photoperiod).**
Nihon Sakumotsugaka Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **26** : 269–70. [Japanese].
Some differences in the incidence of retarded pistil development due to unfavourable photoperiodic conditions are noted between a northern and a southern buckwheat strain.

## OATS

313 Ishibashi, K., Tanaka, H. & Kunitomi, M.
**(Studies on oats for use as green manure. I. On the selection of promising varieties and their productivity for green manuring).**
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. Exp. Sta. 1955 : No. 52 : 153–62. [Japanese].
Data are provided on the green-matter production of a series of Japanese and introduced varieties after 1–3 cuts.

314 Vinogradova, N. M.
**(The oat variety Nemčinovskij).**
Bjull. naučn.-teh. Inform. naučn.-issled. Inst. Zemled. centr. Rajon. nečernozemn. Polosy (Bull. sci.-tech. Inform. agric. res. Inst. centr. Regions nonchernozem Belt). 1956 : No. 1 : 38–40. [Russian].
The oat described was selected from a cross of Moscow A315 x Orel [Eagle]. In the Moscow area it gave an average yield of 38·4 c. of grain per ha., compared with 34·1 c. from the standard variety Dippe in the period 1949–53. It has proved less prone to lodging than Orel and other varieties. [Cf. XXVII, 2846].

315 Heyland, K. U.
Sind Spelzenlänge und Spelzenfarbe Qualitätsmerkmale des Haferkorns? (**Are husk length and husk colour signs of quality of the oat grain?**).
Mitt. dtsch. LandwGes. 1958 : **73** : 640-41.

Although varieties differ in the length of the husk on unthreshed grain, the differences are so small after threshing that they have little influence on the sowing rate, when a drill is used; the length of the husk is also not considered to be a measure of the proportion of husk in the yield. Furthermore, colour and length of husk are not correlated with any important quality characters of the grain.

316 **Rust-resistant oats.**
Agric. Res., Wash. 1958 : **7** : No. 1 : 15–16.

Studies carried out in Puerto Rico resulted in nine wild and 27 cultivated oats being found resistant to race 264 of crown rust. The cultivated varieties comprised 11 different genetic sources of resistance to race 264.

317 Griffiths, D. J.
**Physiological specialization of oat crown rust (*Puccinia coronata* Corda f. sp. *avenae* (Erikss. & Henn.) Erikss.).**
Trans. Brit. mycol. Soc. 1958 : **41** : 373–84.

Ninety-two single spore cultures from 24 different uredospore collections of crown rust obtained from sources in south Wales and south-west England were examined during the period 1949–53. On the basis of the reaction of Murphy's standard set of 13 differential varieties, five new physiological races were isolated from the 12 collections made in 1949 and 1950; the new races were designated by the numbers 96–100.
Again using Murphy's set of differential varieties, 12 races were isolated from the collections made in 1951–53. Three of these races, 96, 98 and 99, had occurred in the 1949 and 1950 collections, one isolate was identical with race 108, and two of the races proved to be indistinguishable from each other when tested with a revised set of differential varieties and gave reactions identical with that of race 229; race 232 was also identified. The five new races were given the numbers 271–275. Races 274 and 275 attacked the varieties Bond and Victoria, which had up to 1952 proved resistant to all known races of crown rust in Britain.
With reference to these results, the breeding of resistant oat varieties is discussed. It is suggested that it might be worth while to breed for moderate resistance as opposed to high resistance; moderate resistance would have a smaller selective action on the rust population and the rapid multiplication of races capable of attacking resistant varieties would be avoided.

318 Stewart, D. M. & Cotter, R. U.
**A new and virulent culture of oat stem rust.**
Phytopathology 1958 : **48** : 389–90.

The occurrence of the unusually virulent new race 13A of *Puccinia graminis* var. *avenae* is reported.

## RYE

319 Piunovskij, I. M.
**(The work at the Chair of Plant Culture in the last 40 years).**
Trud. Belorussk. sel'skohozjajstv. Akad. (Trans. White Russ. agric. Acad.) 1957 : **26** : No. 2 : 15–28. [Russian].

Among the cereals tested at Gorki, Mogilev province, was the winter rye Šatsk and the barleys Nudum 758 and Nudum 8627. The rye, which is thought to have arisen by open pollination of a local variety by a mutant form of Petkus, is hardy and outyields all the local varieties. Both barleys originated from the Institute of Plant Industry and are more productive than the standard variety Viner.

320 Ruebenbauer, T.
Prace hodowlane nad krótkosfomą odmianą żyta. (**Breeding work on a short-strawed variety of rye**).
Postępy Nauk Roln. 1954 : **1** : No. 2 : 7–10.

The possibility of obtaining a short-strawed rye variety is discussed in general terms, its importance for mechanical harvesting being emphasized.

321 Borojević, S.
Heterosis raži, proizveden križanjem domaćih populacija i sorata. (**Heterosis in rye obtained by crossing local populations and varieties**).
Poljopr. Znanst. Smot. 1957 : **16** : 29–65.

Heterosis for yield was observed in several rye hybrids obtained at Zagreb by crossing (*a*) local Jugoslav varieties *inter se*, (b) local varieties with cultivars and (c) cultivars *inter se*. The tabulated data provide information on yield, number of grains, amount of sterility, 1000-grain weight and grain yield per ear for each hybrid.

322 SYBENGA, J.
**Inbreeding effects in rye.**
Z. VererbLehre 1958 : **89** : 338–54.

Studies were made of six generations of two groups of inbreeding families of Petkus rye; measurements were taken of nine characters and the results are set out graphically. The seed set after selfing increased rapidly after the $S_1$ generation; this was partly an effect of selection for self fertility, this being completed in the $S_3$. Seed set after open pollination showed an irregular and slight decrease. The percentage of fertile pollen suffered the strongest and also a consistent inbreeding effect, this being partly due to a decrease in chromosome pairing in meiosis. Inbreeding was less deleterious to ovule fertility. The number of bound chromosome arms decreased at a similar rate to that of seed set after open pollination. A positive correlation was found between chiasma frequency and plant height and also between chiasma frequency and pollen fertility. Slight and irregular increases in bivalent length occurred. In general bivalent length was determined independently from chiasma frequency. As regards tillering, there was a consistent and strong increase, this being partly due to the segregation of recessive factors for large numbers of tillers but some lines with reduced numbers of tillers also appeared. Plant weight and height decreased but the diameter of the stem just below the head was not influenced by inbreeding It is thought that differences between years as regards external conditions may be responsible for some of the irregularities in the curves of inbreeding effects.

Metaphase I was studied in detail and it was found that in some groups of genetically identical cells, which appeared to be in the same physiological state, a higher number of chiasmata and bound chromosome arms were present in early metaphase I than in late metaphase I. This was taken to mean "that not all chiasmata are maintained till anaphase and that 'terminalization' does not stop at the chromosome ends;" so that "anaphase" starts at early metaphase and then increases reaching a peak in anaphase proper. The shape of the bivalents in some cases suggested that ring bivalents change to rod bivalents and rod bivalents to univalent pairs. The relation between chiasma frequency and terminalization and the variance of chiasma frequency within anthers and between florets were also studied.

An increase in variability was found in the inbred generations as compared with the $S_0$. This is thought to be due to segregation; the considerable variability in later inbreeding generations may also be due in part to reduced phenotypic stability with homozygosis. Unavoidable selection such as that resulting from a cold winter is also thought to be a cause of irregularity in inbreeding curves.

323 IL'ENKO, G. T.
**(A valuable form of rye from the Azerbaijan area).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 71–73. [Russian].

The selection of grain and forage rye types from forms occurring intermixed with other crops in Azerbaijan is discussed. The results include a new variety Pereval [Pass], characterized by long ears, resistance to shedding, large grain and good baking quality. It is highly productive of green matter when grown for forage. Other selections include a form with large red grain and another with large white grain. The latter has a vitreous endosperm resembling that of hard spring wheats.

324 BOROJEVIĆ, S.
Biološka i gospodarska svojstva naših domaćih raži. (**The biological and agronomical properties of our local ryes**).
Poljopr. Znanst. Smot. 1957 : **16** : 5–28.

Tabulated information on habit, maturation, ear length, number of spikelets, productiveness of spikelets and ears, amount of sterility and 1000-grain weight of some Jugoslav populations is presented and discussed in relation to their breeding value. All the populations, referred to as balanced heterozygous populations, were inferior in most economic characters to Maksimirka 2 and some other cultivars. It is thought however that the populations, all of which are adapted to the climatic and soil conditions of Jugoslavia, can be improved by selection and breeding and that heterotic hybrids can be produced by crossing the best selections with cultivars.

325 LUNDQVIST, A.
**Self-incompatibility in rye. III. Homozygosity for incompatibility factors in relation to viability and vegetative development.**
Hereditas, Lund 1958 : **44** : 174–88.

From three clones of the diploid rye Steel, all of which had previously been shown to be heterozygous at loci *S* and *Z* for incompatibility [cf. XXVII, 1682], 28 families were obtained within which it was possible to compare plants

heterozygous at both loci with siblings homozygous at one of the loci and heterozygous at the other. Homozygosity at either of the loci did not appear to have any deleterious effect on plant viability or on vegetative development as measured by plant height, straw diameter and tillering. In view of the observation, specifically made within one of the three clones, that a single incompatibility factor common to pollen and style caused no functional disadvantage to the pollen carrying it, it is concluded that homozygosity for incompatibility factors may occur naturally in a population and that no particular opportunity therefore exists for deleterious recessive genes to accumulate in regions adjacent to the loci *S* and *Z*.

## MAIZE

326 Kinš, A. S. & Jakuhina, A. F.
**(The breeding and seed production of maize).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 35–39. [Russian].

This report of a conference held in Moscow in January 1958 refers briefly to breeding research at various Soviet institutes, including the production of male-sterile lines and other maize inbreds. Most of the varieties, intervarietal hybrids and single, double and top-crosses mentioned have been in production for some time.

327 Hadžinov, M. I.
**(The breeding of maize).**
Kukuruza (Maize) 1958 : No. 1 : 27–32. [Russian].

This report on breeding work at Krasnodar deals with testing of inbreds and hybrid populations, the transference of white grain to yellow-grained inbreds and hybrids, and the development of male-sterile and pollen-restoring lines in respect of the Moldavian and Texan types of sterility [XXVIII, 454]. Among the practical results are new promising lines, top crosses and double crosses, and hybrid populations such as the early ripening Krasnodar 10/53 and Krasnodar 12/54. These populations comprise double-cross and single-cross hybrids and remain productive for a number of years. They are regarded as valuable forage types for areas newly sown with maize. Worth mention is the white-grained top cross Krasnodar 4 (Sterling x 155–23). It yields 5·8 c. per ha. more than Sterling. The new double crosses Krasnodar 8 (28 x 29) x (75 x 116) and Krasnodar 9 (44 x 38) x (75 x 116) outyielded VIR 42 [Institute of Plant Industry 42] in three successive years.

328 Pelton, J. S.
**Expression of the gene $d_1$ in the first three leaves of *Zea mays* L.**
Butler Univ. bot. Stud. 1956 : **13** : 66–73.

Studies of the first three seedling leaves in 91 normal ($D_1d_1$ or $D_1D_1$) and 31 dwarf ($d_1d_1$) sibs showed that the dwarfing effect upon leaf length of the gene $d_1$ is expressed increasingly strongly in successive leaves. Differences in width were inconsistent, but the homozygous recessives tended to have wider leaves. Mature leaf length was reached increasingly slowly in the dwarfs while maturation date of leaf width showed no consistent trend.

329 Weber, A. V.
**Growth of the shoot apex in dwarf-1 and its normal segregates in four inbred lines of maize.**
Diss. Abstr. 1958 : **18** : Publ. No. 24,680 : p. 40. (Abst.)

Normal inbreds and their counterparts carrying the gene dwarf–1 were compared with respect to morphological, histological and developmental features. The expression of the gene was in the same direction in all the lines with reference to any one character, the degree of expression of the character in question varying according to the interaction of the gene with its genetic background.

330 Jánossy, A.
A kukorica fajtakérdése. **(The maize variety question).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1956 : **9** : 365–69.

Interinbred hybrids such as Mv1, Mv5 and Mv26 have proved far superior to intervarietal hybrids but are not yet produced on a wide enough scale. Production of hybrid seed by the larger farms is advocated and the development of new varieties with improved resistance to lodging, pests and diseases is urged.

331 Rozganova, V. N.
**(Breeding and seed production of maize in the Smolensk province).**
Bjull. naučn. -teh. Inform. naučn.-issled. Inst. Zemled. centr. Rajon. nečernozemn. Polosy (Bull. sci.-tech. Inform. agric. res. Inst. centr. Regions nonchernozem Belt). 1956 : No. 1 : 36–37. [Russian].

Indications are given of the most promising parental combinations for the production of hybrid varieties. One of them will produce up to 40 c. of mature grain and over 300 c. of green

matter per ha., whilst another yields 20 c. of ripe grain and 400 c. of green matter.

332 **(High-yielding varieties and hybrids).**
Kukuruza (Maize) 1958 : No. 1 : p. 63. [Russian].

Mention is made of highly productive maize varieties and top-crosses bred at the Georgian Breeding Station. The latter include (139 x 167) x Kartuli Krugi, (133 x 155) x Kartuli Krugi, Abašskaja Želtaja [Abašskaja Yellow] x (133 x 155), and Adžametskaja Belaja [White Adžametskaja] x (139 x 167), all of which outyield the standard variety Krasnodar 4 by a good margin.

333 El Hattab, H. S.
**A comparison of yield and protein content in some local and imported double crosses in maize.**
Ann. agric. Sci., Cairo 1957 : **2** : No. 1 : 131–36.

The present open-pollinated maize varieties grown in Egypt give a considerably lower yield than that obtained by hybrids in other countries. The standard variety American Early has been compared both for yield and protein content with a large number of local and imported double-cross hybrids. In respect of yield, only one imported hybrid, Dixie 33, was significantly superior to the standard and two local hybrids, Giza hybrids 93 and 53, surpassed this by 140 and 130% respectively. Dixie 33 and American Early had the lowest protein content, Giza hybrids 90, 92 and 96 the highest.

334 **Hybrid maize for Natal.**
Fmg. in S. Afr. 1958 : **34** : 40–41.

The method of producing hybrid maize is briefly described, mention being made of characters on which selection is based during inbreeding.

335 Horner, E. S., Chapman, W. H. & Lundy, H. W.
**Florida 200. A new yellow field corn hybrid for north and west Florida.**
Circ. Fla. agric. Exp. Sta. 1957 : No. S-95 : Pp. 6.

Florida 200 was developed by recurrent selection for specific combining ability, according to the method described by Hull [XV, 996]. The single cross F44 x F6, the seed parent of the double hybrid Dixie 18, was used as the recurrent specific tester. Nine third-cycle lines were selected on the basis of their performance in the test crosses. They were then crossed in all possible combinations and equal proportions of the seed were mixed to form a composite, designated Florida Synthetic 3B. The pedigree of Florida 200 is (F44 x F6) x Fla. Syn. 3B. Fla. 200 has outyielded Dixie 18 in most trials while being similar to this hybrid in other respects.

336 Crane, P. L. & Miles, S. R.
**Performance of dent corn hybrids in Indiana, 1953–1957.**
Res. Bull. Ind. agric. Exp. Sta. 1958 : No. 660. Pp. 19.

Information is given on the performance of commercial hybrids.

337 Batikjan, G. G. & Čolahjan, D. P.
**(The behaviour of double-cross hybrids and hybrid populations of maize in the montane districts of the Armenian SSR).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 56–61. [Russian].

Tabulated information is given on degree of earliness, plant weight and height, number of ears per plant and ear weight for different varieties and hybrids tested in two districts in 1955 and 1956. Double crosses from the Institute of Plant Industry and populations from Krasnodar were the most productive.

338 Horesh, A.
**(Introduction plots of maize hybrids).**
Sadeh (Field)/Hassadeh 1958 : **38** : 541–43. [Hebrew].

Ten different hybrids have been tested in various locations in Israel. Of these, 22 gave the best grain and forage yields. The second best was 182 which is suitable for industrial and culinary purposes. Hybrid 31 needed the shortest time to ripen, 80 days.

339 El Hattab, H. S.
**Comparative yield test with American hybrid corn in 1953.**
Ann. agric. Sci., Cairo 1957 : **2** : No. 1 : 219–24.

Comparative yield trials have been made with the standard maize variety American Early and a large number of American hybrids to test their suitability to Egyptian conditions. Many of these gave improved yields, notably Hybrid 15W. Higher yielding forms tend to have more ears per plant.

340 Duarte, L. S. do N. & Groszmann, A.
Híbridos de *Zea* x *Euchlaena*. 1. Análises comparativas em raíz e folha.
**(Hybrids of *Zea* x *Euchlaena* 1. Comparisons of root and leaf).**
Rev. Agric., Piracicaba 1958 : **33** : 99–116.

In a series of measurements made on *Z. mays*,

*E. mexicana* and three hybrids, significant differences were detected between the hybrids and the parents in respect of leaf breadth, thickness of the main vein, number of stomata and number of veins. In all these respects and in ratio of number of stomata : number of veins the values were higher for maize than for teosinte, whereas in ratio of xylem to phloem teosinte was the higher. The hybrids were intermediate in respect of these characters and in most measurements made on the root. They had narrower leaves than maize, a smaller number of stomata and leaf veins and a lower ratio of stoma number : leaf breadth; their proportion of xylem : phloem was higher, as in teosinte; this, together with the thinner root epidermis, suggests that they too will be more drought resistant than maize. One of the three hybrids displayed greater resemblances to maize than the other two, though all were later in maturity.

341 Valjura, V. I.
**(Maize breeding).**
Bjull. naučn.-teh. Inform. naučn.-issled. Inst. Zemled. centr. Rajon. nečernozemn. Polosy (Bull. sci.-tech. Inform. agric. res. Inst. centr. Regions nonchernozem Belt) 1956 : No. 1 : 31–35. [Russian].

Two new cultivars suitable for the Nonchernozem Belt of the Soviet Union are described. Nemčinovskaja, a hybrid of Belaja Anglijskaja [White English] x Minnesota 13 Extra, is slightly inferior to Partizanka in yield of green matter but produces ripe ears in the Moscow area and even in Latvia, which Partizanka does not.
Moskovskaja Rannjaja [Moscow Early] is a hybrid of Belaja Anglijskaja x Gruševskaja; it ripens as early as the Siberian maize varieties but excels them in yield. Several of these Siberian varieties, when pollinated with forms from more southerly areas, have given hybrids which equal the Siberian maizes in earliness but exceed them in total yield by 65–87·7%.
Two male-sterile lines have been selected from the crosses Partizanka x Severjanka [maize from the North] and Partizanka x Minusinka [maize from Minusinsk].

342 Ruebenbauer, T.
Maisanbau und -züchtung in Polen.
**(The cultivation and breeding of maize in Poland).**
Dtsch. Landw., Berl. 1958 : **9** : 210–12.

At the Agricultural High School of Lublin, Lewicki has been investigating the lowest temperatures at which maize will germinate; flint types germinated at 10° C. but dent maize required a higher temperature. Seedlings of dent maize were more hardy than the flint types; the varieties Przebędowska Bursztynowa [Przebędowo Amber] and Dar Północy [Midnight Gift] are mentioned for the frost resistance of their seedlings. Tabulated information on the characteristics of Polish flint and dent varieties is provided. Breeding for midearly productive varieties is in progress and some crosses between early flint varieties as the female parents and medium-late dent varieties as the male parents gave promising results. The results of a trial of hybrids grown at Smolice indicated that the flint variety Wielkopolanka [Maize from north-west Poland] was the best female parent and Mikulicka, descended from the American variety Lancaster, was the best male parent; good maize for silage was obtained from this cross, and other combinations, which were promising in this respect, are also mentioned.
Attention is being given to the development of inbred lines from Polish and foreign varieties and the production of synthetic varieties is also under way.

343 Spasojević, V.
Heterozis kod kukuruza koji se bokori.
**(Heterosis in tillering maize).**
Arh. poljopr. Nauk 1957 : **10** : No. 30 : 83–90.

Mention is made of flint-maize inbreds, including a line showing a tendency to tiller, developed at Belgrade. The character was later transferred to several other inbred lines, which were utilized for the development of highly productive single-cross and double-cross hybrids. The single crosses had 4–8 stems and averaged 3·5 normally developed ears per plant and the double-crosses 2–10 stems and 2–7 ears per plant. The best double-cross hybrid yielded 89·2 c. of ripe ears and 137 c. of dry matter per ha., as against 52·8 c. and 55·3 c. per ha. of the standard variety.

344 Blickenstaff, J., Thompson, D. L. & Harvey, P. H.
**Inheritance and linkage of pollen fertility restoration in cytoplasmic male-sterile crosses of corn.**
Agron. J. 1958 : **50** : 430–34.

The ability of 18 lines to bring about complete restoration of pollen fertility when combined with ♂-sterile lines carrying the T type of cytoplasm was due to a single dominant gene, *Rf*, on chromosome 3. The following gene order

and map distances were established: $A_1$ 36·2 $Lg_2$ 20·8 *Rf*. Restoration of pollen fertility in crosses with three partial-restorer inbreds apparently depended on several genes. In crosses involving complete restorers, positive and significant correlations were noted between plant height and pollen fertility in some cases. A greenhouse test and field observations provided evidence that long photoperiod and possibly high temperature may have an inhibiting effect on fertility restoration.

345 Judin, B. F.
**(Some peculiarities in the flowering of maize in the Central Urals).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 861–67. [Russian].

Observations at Sverdlovsk in 1955–6 showed that the majority of North American varieties were characterized by protandry whereas Asiatic varieties tended more towards protogyny. In the three Soviet varieties observed the degree of protandry was less than in those from North America.

Great variation in type of flowering was observed in $F_1$ hybrids, especially when the parents differed in time of maturity; in pollinations of a late variety by an early type there was a preponderance of protogyny in the progeny.

346 Zamkovoj, G. T.
**(The position of axillary buds and sexual differentiation in maize plants).**
Kukuruza (Maize) 1958 : No. 2 : 29–32. [Russian].

The development of ears, tassels and mixed inflorescences from the buds in relation to their different positions on the stem was investigated at the Krasnograd Research Station, Har'kov province, and minor varietal differences in this respect are mentioned.

347 Savage, R. R., Deatherage, W. L., MacMasters, M. M. & Senti, F. R.
**Note on a rapid method to screen corn samples for approximate amylose content in the starch.**
Cereal Chem. 1958 : **35** : 392–94.

A procedure is described for eliminating samples of maize with starch of less than the required amylose content; the method depends on the degree of gelatinization of the starch brought about by treatment with a solution of 0·111 N KOH and heating at 75° C. Starch of high amylose content resists gelatinization.

348 Storey, H. H. & Howland, A. K.
**Resistance in maize to the tropical American rust fungus, *Puccinia polysora* Underw. 1. Genes $Rpp_1$ and $Rpp_2$.**
Heredity 1957 : **11** : 289–301.

The genetics of resistance to *P. polysora* has been studied at Muguga, Kenya, by "controlled inoculation of seedlings in glasshouses and by breeding from individual plants selected on seedling tests.

"Two major genes for resistance were recognized. The first, $Rpp_1$ conferred high hypersensitivity against the prevalent physiologic race of *P. polysora* (Race EA.1), made evident on inoculated leaves by minute chlorotic-necrotic lesions without uredosori; but it conferred no recognizable resistance to a second race of the fungus (EA.2). $Rpp_1$ appeared to be fully dominant. The second gene, $Rpp_2$, conferred a lesser hypersensitivity, typically necrotic lesions with small sori, but was equally effective against races EA.1 and EA.2. This gene was incompletely dominant. $Rpp_2$ appeared to be subject to considerable minor-gene modification, but $Rpp_1$ much less so." [From authors' summary].

349 **Dwarf corn does well in Kansas.**
What's New Crops Soils 1958 : **10** : No. 8 : p. 26.

In a trial held in Kansas, normal maize hybrids gave slightly higher yields and were of better quality than dwarf hybrids; these latter suffered more from ear-worm attack because the ears touched the ground after the stalks had matured. The dwarfs dropped 1·8% of the ears produced compared with 10·2% for the normal hybrids. It has been said that dwarf hybrids are less susceptible to lodging but this could not be ascertained in 1957 when very little lodging occurred in either type of hybrid.

350 Bell, M. E.
**Histology of the maize plant in relation to susceptibility to the European corn borer.**
Iowa St. Coll. J. Sci. 1956 : **31** : 9–17.

Larvae of *Pyrausta nubilalis* were found to feed almost entirely on the upper surface of the leaf, the bulliform cells forming the centre of initial attack. The possibility of a chemical difference between resistant and susceptible lines was suggested by the observation that the bulliform cells of the former retain more safranin on staining than do those of the latter. In resistant lines, pin-hole lesions involving few cells are formed, while on susceptible lines the lesions are larger.

351 Kelleher, T., Robinson, H. F. & Comstock, R. E.
**Precision of estimates of variance components.**
Biometrics 1958 : **14** : 69–77.

An experimental procedure used in an investigation into quantitative inheritance in maize has provided, over a period of years, extensive data which the authors have analysed in order to see how far the assumptions of homogeneity of variances and normality, on which the theory depends, are verified in practice. Three tests were carried out: (1) a test for nonnormality based on skewness, (2) an analysis of variance of two components of variance and (3) a comparison of residual mean squares with theoretical values. The results of (1) and (3) are satisfactory but there is some evidence that one of the components has an appreciable variation from year to year.

## BARLEY

352 **Spring barley variety trials, 1955–1957.**
Rur. Adv. leafl. Edinb. E. Scot. Coll. Agric. 1957 : No. 42 : (Unpaginated).

Beorna, Bonus, Maythorpe, Proctor, Provost and Ymer were tested at trial centres in eastern Scotland. The varieties showed only small differences in grain yield. Maythorpe was the earliest variety to ripen, while Provost and Proctor were the latest. All were short-strawed, Maythorpe and Beorna exhibiting the greatest tendency to lodge. Proctor, Provost and Beorna proved to be the most acceptable for malting, and Maythorpe, Ymer and Bonus for milling.

353 Bell, G. D. H.
**Barley breeding methods and objectives.**
Brew. Guard. 1958 : Pp. 10.

After briefly mentioning attributes of the barley plant which are of interest to the plant breeder and pointing out that in practice no character can be considered in isolation, the author discusses methods of breeding and selection and outlines some aims for future breeding work.

354 Gotoh, K.
**Genetic analysis of varietal differentiation in cereals. VII. Interrelationships between potential variabilities and environmental conditions.**
Japan. J. Bot. 1957 : **16** : 46–60.

Local strains of the barley Hosogara 2 have been classified into three groups of genotypes, X, Y and Z, according to their morphological characters and growth habit [cf. XXVI, 2327–28]. Survival rate of overwintering plants in the southern strains (Group 2) which are characterized by spring habit was lower than that of plants with winter habit and belonging to group X which originated in Hokkaido. Another experiment was carried out to determine the response of the medium-winter strain D (group Y) from the Aomori prefecture to spring sowing. When grown at the end of February, variability was observed between lines in number of plants producing ears. The effect of sowing at three dates, respectively at the end of November, December and January, in relation to frequency of spring habit was also investigated, using four artificial mixtures involving strains of the same or different groups and an $F_3$ hybrid population of local strains of Hosagara 2. Plants of the spring type were predominant in plots sown on the latest date. It was therefore concluded that the Z group became differentiated in southern districts on account of selective advantage over the winter type. Residual heterozygosity and residual heterogeneity of polygenic systems, mutation of polygenes, occurrence of off-types in polyploid crops such as wheat or oats, and natural crossing are discussed with respect to their possible role in intravarietal differentiation. Genetic variability affecting such characters as growth habit, photoperiodic behaviour, reaction to temperature, postharvest dormancy, resistance to cold, drought and diseases and response to soil conditions is regarded as primarily responsible for intravarietal differentiation under the impact of natural selection. The part played by man in bringing about differentiation by control of plant density and in other ways is also considered. Finally, problems involved in the development of multiline varieties are briefly examined.

355 Yamaguchi, H.
**(Experiments on X irradiation of dry seeds of six-rowed barley).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 175–78. [Japanese].

Using the variety Sekitorisai 1 [Saitama Champion 1], mutation frequency and degree of spike fertility over a range of X-ray doses were investigated. The mutants obtained were principally chlorophyll deficiencies. The relation between mutation rate and dose was linear at low doses with some falling off in rate at higher doses.

356 Mochizuki, A. & Reinbergs, E.
**A nineteen-chromosome barley plant.**
Canad. J. Pl. Sci. 1958 : **38** : 106–110.

A colchicine-induced tetraploid strain of the variety OAC21 was produced and from the $C_4$ generation arose a 19-chromosome individual. Details of the morphological and cytological characteristics of this plant are given; it is regarded as a product of the union of $2n$–2 and $n$ gametes.

357 Tsuchiya, T.
**Studies on cross compatibility of diploid, triploid and tetraploid barleys. I. Seed development in reciprocal crosses between diploids and induced autotetraploids.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 48–52.

Crosses were made in both directions between diploids and colchicine-induced tetraploids within varieties of *Hordeum sativum* and within *H. spontaneum* var. *transcaspicum*. The cross *H. sativum* 'Early Golden Melon' ($4x$) x *H. spontaneum* ($2x$) was also effected. Seeds were obtained from most $4x$ x $2x$ combinations. The interspecific cross gave a very high percentage of seed setting (94·7%). Diploid and tetraploid crosses were studied within *H. spontaneum*, Hakata 2 and Hosomugi. Their seed fertility was respectively 90·48, 97·50 and 0%. No seeds from the $2x$ x $4x$ crosses germinated. Eight of the 31 seedlings obtained died at a very early stage. Nearly all the survivors had $2n = 20$ or 21. One plant with $2n = 29$ and another with $2n = 30$ arose from $4x$ x $2x$ in *H. spontaneum*. They may have resulted from the fusion of hyperdiploid eggs and unreduced gametes, or possibly as the result of selfing through unsuccessful emasculation.

358 Johnson, L. P. V. & Taylor, A. R.
**Note on the effect of photoperiod and temperature on the development of spike primordia in barley.**
Canad. J. Pl. Sci. 1958 : **38** : 122–23.

Experiments on rate of development of spike primordia in several varieties of spring barley under different conditions of temperature and photoperiod indicate that photoperiod is probably the basic factor determining the expression of earliness.

359 Sagajdak, I. N.
**(Variability of hooded barley sown as a winter crop).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 132–34. [Russian].

When a hooded barley of var. *horsfordianum* was sown at Odessa for four successive years as a winter crop, morphological modifications appeared in the surviving plants. The changes comprised: (1) variability in the shape of hoods, (2) conversions of hoods into awns, (3) development of ears with both hoods and awns, and with a floret enclosed within the awns, and (4) occurrence of sterile and fertile florets and of underdeveloped, inviable grains in the hoods of the central spikelets of the ear.

On the resumption of spring sowing, the experimental material gave rise to several albinos, which did not survive, and plants which eared in July. After two years of spring sowing, the following types were obtained: plants with modified spikelets and hoods, six-rowed barleys with blue hoods, and two-rowed barleys with blue and normal hoods.

360 Société d'encouragement de la culture des orges de brasserie et des houblons en France. Rapports sur la campagne 1956. **(Society for the promotion of the cultivation of malting barleys and hops in France. Reports for the year 1956).** Pp. 73.

The results of barley varietal trials conducted at various centres throughout France are reported; analyses of malting quality are included. Brief mention is also made of the performance of some recent hybrids.

361 Bendelow, V. M., Meredith, W. O. S. & Johnston, W. H.
**Malting quality of Canadian barleys. VII. Parkland.**
Canad. J. Pl. Sci. 1958 : **38** : 88–93.

The barley variety Parkland is equal to OAC21 in malting quality and yields a higher malt extract. Quality tests made at each stage in the breeding of Parkland are described as illustrating the value of cooperation between plant breeders and cereal chemists in the production of a new variety.

362 Garkavyj, P. F. & Sozinov, A. A.
**(Malting barley in the south of the Ukraine).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 1 : 3–7. [Russian].

Odessa 9 had the best malting properties among the varieties analysed at the USSR Institute of Breeding and Genetics and the Brewing Institute and outyielded all others in the 1955–56 trials at Odessa. Odessa 18, distinguished by very uniform germination, also proved a good malting kind. Mention is made of the new varieties Lesostepnoj [Woody-steppe] and

Južnyj [Southern], which are still under trial. Preliminary data suggest that they have even better malting quality than Odessa 9 and Odessa 18. Lesostepnoj is also more productive than these and is resistant to fungi and Južnyj bears large grain rich in starch even under drought conditions.

363 Suneson, C. A. & Hoyle, B. J.
**Hooded Atlas barley.**
Calif. Agric. 1958 : **12** : No. 7 : p. 11.

In comparative trials carried out at Davis, Calif. between 1953 and 1957, Hooded Atlas gave consistently poorer yields than Atlas, averaging 24% less, and also showed greater susceptibility to diseases. However at the Tulelake Field Station, at a higher altitude, the difference in yield was only 13%.

364 Watson, D. J., Thorne, G. N. & French, S. A. W.
**Physiological causes of differences in grain yield between varieties of barley.**
Ann. Bot., Lond. 1958 : **22** : 321–52.

Experiments carried out at Rothamsted showed that the varieties Proctor and Herta outyielded Plumage-Archer by 10–15% on soil without nitrogen fertilizer; the difference rose to 30% when nitrogen was given. The increased nitrogen supply caused lodging in Plumage-Archer but did not increase its yield. It was found that the dry matter contributed to grain yield by the photosynthesis of unit leaf area was almost equal in all the varieties. The superior yielding capacity of Herta and Proctor was thought to depend on additional photosynthesis in the ears; these two varieties had more photosynthetic tissue in their ears than Plumage-Archer as measured by size and weight. There may also be differences in the photosynthetic efficiency of the ears.

365 Nover, I. & Bandlow, G.
Mutationsversuche an Kulturpflanzen. VIII. Mehltauresistenz und ihre Genetik bei Wintergersten-Mutanten. (**Mutation experiments with cultivated plants. VIII. Mildew resistance and its genetics in winter barley mutants**).
Züchter 1958 : **28** : 184–89.

A report is presented of further studies of eight X-ray-induced mutants of the winter barley Friedrichswerther Berg; these were first found to be resistant to races A and B of *Erysiphe graminis* f. sp. *hordei* in 1951 [cf. XXII, 1409]. Mutant 501 showed resistance to 10 of 14 races investigated; these were $A_1$, $A_2$, $A_3$, $A_4$, $D_1$, $D_3$, $B_2$, $B_3$, $C_2$ and $C_3$. It was susceptible to the four races $B_5$, $B_6$, $C_4$ and $C_5$. The other seven mutants, 511–515, 520 and 525a, were all resistant to races $A_2$, $A_5$, $D_1$, $B_2$, $B_3$, $B_7$, $C_2$ and $C_4$; they were susceptible to races $A_1$, $A_3$, $A_4$, $D_3$, $B_5$, $B_6$, $C_3$ and $C_5$. These mutants are thus useful differential hosts for identifying races of mildew.

Resistance to race $A_2$ was found to be controlled by two independent genes. One determines the resistance of Mutant 501, designated *obsistens*, and the second is responsible for the resistance of the other seven mutants, the *resistens* mutants. In all cases resistance was completely or partially dominant. Mutant 501 appeared to be a mixture of resistant and susceptible forms; possibly back mutations to susceptibility occurred.

The mutants showed changes in other characters also; 511, 515 and 520 were high-yielding, of good standing capacity and early. [Cf. XXVIII, 1653].

366 Clark, R. V. & Dickson, J. G.
**The influence of temperature on disease development in barley infected by *Helminthosporium sativum*.**
Phytopathology 1958 : **48** : 305–10.

The development of symptoms of spot blotch, root rot and seedling blight incited by *H. sativum* (*Cochliobolus sativus*) at different temperatures was investigated, using 6 isolates of the fungus and 6 varieties of barley. Maximum development of spot blotch occurred at 28° C.; the disease developed much more slowly at lower temperatures (16° and 20° C.). The isolates differed in pathogenicity, some being nonpathogenic at 16° and 20° C. Varietal differences in reaction to spot blotch were not pronounced. Root rot and seedling blight developed severely at all temperatures (8°–28° C.), with maximum development at 20°. Differences in varietal reactions to these two phases of the disease and in the pathogenicity of the isolates according to the temperature were not consistent. The experimental error was considerable in all the experiments on root rot and seedling blight.

367 Frecha, J. H.
Comportamiento de cebadas con respecto a la población parásita de *Helminthosporium teres* presente en Argentina. (**The performance of barleys with respect to the population of the parasite *H. teres* present in Argentina**).
Rev. Invest. agríc. B. Aires 1958 : **12** : 41–55.

The above pathogen was able, by means of

artificial inoculation, to attack not only barley but also oats, rye, wheat and species of the grass genera *Bromus, Cenchrus, Dactylis, Elymus, Festuca, Hordeum* and *Lolium.* No distinct physiological races could be determined among isolates of the pathogen from different regions, when tested on barley varieties. Among more than 600 barleys, Hoyo Epuyén, which is also resistant to *Puccinia hordei*, was the most resistant. Also resistant were CI4493, Mancha CI4795, Tifang CI4407 and San Carlos, and, to a lesser extent, Abyssinian CI1243, CI4532, Plush, Rojo [Red] and *Hordeum spontaneum.*

368 Frecha, J. H.
**(Inheritance of the factors for resistance to *H. teres* possessed by the barley varieties Rojo, Hoyo Epuyén and *H. spontaneum*).**
Rev. Invest. agríc. B. Aires 1958 : **12** : 91–95.

Analysis of the $F_2$ and $F_3$ of crosses of Rojo [Red] and *H. spontaneum* with susceptible varieties showed that in each case a single dominant factor for resistance is involved. No susceptible plants were found in the $F_2$ or $F_3$ of the cross between Rojo and *H. spontaneum*, indicating that the factors are the same or closely linked. Hoyo Epuyén also appears to carry a single dominant factor for resistance, as shown by $F_2$ segregation data from crosses with susceptible barleys.

369 Wells, S. A.
**Inheritance of reaction to *Ustilago hordei* (Pers.) Lagerh. in cultivated barley.**
Canad. J. Pl. Sci. 1958 : **38** : 45–60.

$F_1$, $F_2$ and $F_3$ generations of diallel crosses of five resistant varieties and one susceptible variety (Junior) of barley were inoculated with race 6 of *U. hordei* and the results indicate the existence of four genes governing resistance. A dominant gene, possibly identical with the *Uh* gene carried by the variety Brachytic is common to the varieties Titan, OAC21, Ogalitsu and Anoidium. The last variety also carries a second dominant gene *Uh*2, Ogalitsu a recessive *uh*3, and Jet a recessive *uh*4. No association was found between inheritance of covered smut and that of a number of morphological characters.

370 **Scald-resistant barley varieties.**
What's New Crops Soils 1958 : **10** : No. 8 : p. 27.

Amongst a collection of barley varieties from many parts of the world, six barleys were found by the Alberta Department of Agriculture to have high resistance to *Rhynchosporium secalis.* These varieties were low in yield and quality; they were crossed with other barleys superior in these respects. It is suggested that the time has come to start breeding independently for yield and quality instead of considering these characters in relation to resistance to insects, drought and frost.

371 Bryner, C. S.
**Inheritance of scald resistance in barley.**
Diss. Abstr. 1957 : **17** : Publ. No. 23,998 : p. 2752. (Abst.).

The Pennsylvania isolate of *Rhynchosporium secalis* used in this investigation of short-awned, winter-hardy varieties provoked the same reactions in differential barleys as Argentine barley scald race 3. The resistance of Brier depended on a single dominant gene ($Rh_a$), as indicated by data from crosses of this variety with the susceptible barleys Kenbar and Wong.

## MILLETS AND SORGHUMS

372 Garkavyj, P. F. & Danil'čuk, P. V.
**(Agrobiological evaluation of some *Setaria* varieties and forms under the conditions of the southern Ukraine).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 2 : 3–8. [Russian].

Zernovaja 218 [Grain 218], Zernovaja 192 and Moscow 8 outyielded all other varieties in trials conducted by the USSR Institute of Breeding and Genetics. All three varieties have a growth period not exceeding 85 days and were obtained by selection of Mongolian material from the arid regions of Chahar and Suiyuan.

373 Varenica, E. T.
**(*Setaria*).**
Bjull. naučn.-teh. Inform naučn.-issled. Inst. Zemled. centr. Rajon. nečernozemn. Polosy (Bull. sci.-tech. Inform. agric. res. Inst. centr. Regions nonchernozem Belt) 1956 : No. 1 : 43–47. [Russian].

Some early-maturing varieties of *Setaria* sp. capable of setting grain as far north as Moscow and beyond, are described. Moscow 7, a selection from material introduced from China, has

given yields of up to 30·5 c. of grain per ha., exceeding the local standard for the Moscow area, Egor'evskaja, by 21·8%; it matures in early September, has a 1000-grain weight of 3·5–3·7 g. and is free from smut and lodging. A selection, Nemčinov 10, now exceeds it in both yield and earliness. Two selections from a local variety are suitable for both grain and fodder and Moscow 2, another selection from local material, is very early and matures in the provinces of Irkutsk and Archangel.

374 Gricenko, R. I.
**(A description of initial material of *Setaria* with regard to resistance to diseases and pests).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 70–71. [Russian].

Varietal differences between some Soviet varieties of *S. italica* and introductions from China and Korea in resistance to loose smut are noted and material resistant under conditions of artificial infection in the Kuban' was selected. Late ripening Soviet varieties such as Kubanskaja Belaja 73 [Kuban' White 73], Dnepr 38 and Har'kov 5 were more resistant than other varieties to attack by *Pardileus calceatus*.

375 **Kentucky tests grain sorghums.**
What's New Crops Soils 1958 : **10** : No. 8 : p. 26.

Of 30 grain-sorghum varieties tested by the Kentucky Experiment Station in 1957, the hybrid DeKalb-D50A gave the highest yield, this being 104·6 bushels per acre; RS610 gave the second highest yield of 95·7 bushels per acre. Yields from hybrids were about 20 per cent higher than those from standard nonhybrid varieties.

376 Ross, W. M.
**A comparison of grain sorghum varieties in plots with and without border rows.**
Agron. J. 1958 : **50** : 344–45.

In a five-year study in Kansas, involving four varieties, no difference in yield, heading date, height or test weight was found between plots with and without border rows.

377 Arnon, Y. & Berkowitz, J. [Berkovits, Y.]
**(Tests with hybrid sorghum varieties).**
Sadeh (Field)/Hassadeh 1958 : **38** : 426–31. [Hebrew].

Field trials of a series of mainly introduced sorghum varieties and hybrids are reported. It is noted that maximum yields were only obtained by allowing the plants to grow too high for machine harvesting.

378 Mital, S. P., Vishnu Swarup & Joshi, A. B.
**Cytoplasmic male sterility in jowar (*Sorghum vulgare* Pers.).**
Curr. Sci. 1958 : **27** : p. 314.

A plant showing cytoplasmic male sterility was found in 1955 among plants of strain IC2360 at the Indian Agricultural Research Institute, New Delhi. It is now being crossed with other lines in a search for lines which will either restore fertility or maintain sterility. Since the male-sterile line possesses many desirable agronomic characters it can be used directly for the production of hybrid seed, thus avoiding a lengthy back cross programme.

379 Blessin, C. W., Van Etten, C. H. & Wiebe, R.
**Carotenoid content of the grain from yellow endosperm-type sorghums.**
Cereal Chem. 1958 : **35** : 359–65.

Descriptions are provided of methods of estimating total carotenes and total xanthophylls and for isolating and identifying carotenoids, the procedures being adapted for use with grain sorghum. Domestic varieties contained about 1·5 p.p.m. of total carotenoids whereas crosses between these varieties and African yellow-endosperm sorghums had carotenoid contents of up to 8 or 9 p.p.m.

## RICE

380 **(An account of the preliminary meeting of the Ministry of Agriculture and Forestry on rice breeding in 1957).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 212, 220, 227, 234. [Japanese].

The subjects referred to comprise breeding methods, including induction of artificial mutations, the ecological adaptation of rice varieties and disease resistance.

381 Toriyama, K. & Futsuhara, Y.
**(Estimates of heritabilities in individuals and lines of rice).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 208–12. [Japanese].

The $F_5$–$F_7$ of the cross Tokaisembon x Fujisaka 5 were investigated. Heritabilities and parent-offspring correlations were calculated for heading date, culm height, panicle length, panicle number, overall weight and grain yield. Heritabilities of the first two of these characters were high; they were much lower for the rest.

Correlation coefficients between grain yield and other characters were generally low.
Two selection procedures for grain yield were compared: (1) vigorous selection in the $F_5$ and relaxed selection in the $F_6$; and (2) *vice versa.* The second procedure was more effective. Line selection was found to be much more efficient in breeding for grain yield than individual-plant selection.

382 Syakudo [Shakudo], K. & Kobori, O.
**(Statistical studies on the genetic and environmental components of yield. I. On differences in the function of genes $E_3$ and $E_4$ and in genetic parameters associated with changes in the sowing date in rice).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 17–22. [Japanese].

The nine genotypes obtained from later hybrid generations of the cross Aikoku [Patriotic] ($E_3E_3e_4e_4$) x Ginbozu [Silver Bonze] ($e_3e_3E_4E_4$) were used. These genes have a pleiotropic influence on heading date, culm length and ear weight. The plants representing each genotype were sown on five different dates between 16 April and 15 June inclusive. Observations were made on heading period, culm length, panicle length, weight of panicles per plant, number of panicles, number of grains per panicle, and grain weight for each genotype at each sowing date. Heading period and culm length showed high heritability. In all cases, the heritability values were affected by sowing date. High positive genotypic correlations were found between heading period, culm length and weight of panicles per plant. Environmental correlations varied irregularly with sowing date.

383 Katsuo, K. & Mizushima, U.
**(Studies on cytoplasmic differences in rice. I. On the fertility of direct and reciprocal crosses between cultivated and wild rices).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 1–5. [Japanese].

Reciprocal differences in $F_1$ hybrid fertility were not observed in crosses between Japanese and Indian varieties. However, in crosses between either Japanese or Indian cultivated varieties, on the one hand, and wild Indian or Chinese rices, on the other, the $F_1$ hybrids with the wild variety as mother plant were invariably less fertile than the reciprocals. This difference in fertility persisted till the $F_3$ in the cross Fujisaka 5 x Chinese wild rice. The back cross [(Fujisaka 5 ♀ x Chinese wild rice ♂) ♀ x wild rice ♂] ♀ x wild rice ♂ was fully fertile but [(Chinese wild rice ♀ x Fujisaka 5 ♂) ♀ x Fujisaka 5 ♂] ♀ x Fujisaka 5 ♂ was less than 10% fertile.

384 Yamaguchi, H. & Kimura, S.
**(On intervarietal variation in some characters of the kinds of upland rice commonly grown in Japan).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 241–46. [Japanese].

The range of variation of a collection of over 130 Japanese varieties was examined.
Most of these showed a positive phenol reaction in contrast to irrigated rices, but in respect of degree of destruction of the endosperm by KOH solution, mesocotyl length when grown in the dark and the length/breadth ratio of the unhulled grain, a continuous range in variation was observed. The length/breadth ratio was negatively correlated with mesocotyl length and degree of endosperm destruction by KOH. The various combinations of the three continuously varying characters could be arranged as subdivisions of the Tropical Insular and Temperate Insular varietal groups of Oka. Most of the Japanese upland varieties pertained to the Temperate Insular group; the Tropical Insular varieties were mainly from southern Kyushu.

385 Matsuo, T., Yamaguchi, H. & Ando, A.
**A comparison of biological effects between thermal neutrons and X-rays on rice seeds.**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 37–45.

Presoaked grains of the variety Caloro were more sensitive to X irradiation than dry grains; this difference was not evident in respect of neutron treatment. Sensitivity to both types of irradiation shows varietal differences.
The frequency distribution of spike fertility in irradiated material of the variety Rikuu 132 was discontinuous with four modes. The relation between mutation frequency and dose was linear in the case of neutron irradiation of Norin 29 [Ministry of Agriculture and Forestry 29] and quadratic in the case of X-ray and neutron irradiation of Rikuu 132. Neutron irradiation induced mutation more readily than X rays. The frequencies of the various types of chlorophyll mutations induced by the two kinds of radiation were not significantly different.

386 Yamaguchi, H.
**(On mutation induced in dry rice seeds by mustards and X irradiation).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 179–85. [Japanese].

A comparative study of the mutagenic effects

of nitrogen mustard, its N-oxide and X rays on the variety Norin 29 [Ministry of Agriculture and Forestry 29] is reported. Nitrogen mustard differed from the N-oxide and X irradiation in inducing a considerably higher percentage of *striata* mutations.

387 **(New varieties of irrigated rice, 1957).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 240, 246, 252. [Japanese].

The following varieties have been registered. Yachiminori (= Norin 105 [Ministry of Agriculture and Forestry 105)], (1718 x Norin 34) x 1718, is a high yielding rice intended to replace Norin 34 and other varieties grown in Hokkaido. Yamabiko (= Norin 106), Chukyoasahi [Chukyo Rising-sun] x Norin 22, is a variety with large lustrous grains recommended for central Japan. Hamayuu (= Norin 107), Shinriki 798 x Norin 23, is a prolific late variety. Okumasari (= Norin 108), Norin 29 x Norin 8, is a variety outyielding Norin 10, recommended for northern and upland areas. Akiminori (= Norin 109), Norin 8 x Nii 7 (Niigata 7) is an early mid-season variety recommended for various regions in the island of Honshu. Tarehonami (= Norin 60*), Norin 22 x Hokuriku 11 [Northern 11], is a variety yielding well after late planting; it is adapted to conditions in northern Japan. Yomohikari (= Norin 111), Norin 22 x Ginbozuwase [Early Silver Bonze], is a rice resistant to *Chlorops oryzae* and adapted to northern and montane areas in Japan.

388 **(New varieties of upland rice, 1957).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : p. 252. [Japanese].

A brief description is given of the newly registered variety Hatanishiki (= Norin 37 [Ministry of Agriculture and Forestry 37]), from the cross Norin 14 x Norin 15; it is a high-yielding variety, markedly resistant to cold and with some resistance to drought.

389 **New rice variety.**
What's New Crops Soils 1958 : **10** : No. 9 : 30–31.

A promising selection from a cross between Bluebonnet and Century Patna 231 is under trial in Texas, Arkansas and Louisiana. In performance it equals Century Patna 231 and is similar to Bluebonnet in quality.

390 Din, I. [Ting, Y.]
**(The origin of cultivated rice species and their differentiation in China).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 27–43. [Russian].

[Cf. XXVIII, 4247].

391 Masima [Mashima], J., Sato, H. & Uchiyamada, H.
**(Correlations between sterility in intervarietal rice hybrids and 4-ploid sterility).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 141–44. [Japanese].

In continuation of work reported earlier [XXVII, 575], a total of 38 tetraploid lines were induced in (1) fertile varieties, (2) fertile intervarietal hybrids, (3) semisterile intervarietal hybrids and (4) sterile intervarietal hybrids. The effect of polyploidization was to reduce fertility in (1) and (2) and increase it in (3) and (4).

392 Yang, K.-C.
**(Studies on the aftermath growth of rice).**
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin. 1958 : **9** : 107–35. [Chinese].

This study includes a section on the influence of variety on aftermath panicle formation. In order to obtain a useful second crop, early-maturing varieties with an adequate number of functional resting buds are required.

393 Lin, C.-I.
**(Studies on the factors affecting germination in the panicle in rice).**
Tai-wan Ta-hsueh Nung-hsueh-yuan Yen-chiu Pao-kao/Mem. Coll. Agric. Taiwan Univ. 1957 : **4** : No. 4 : 13–26. [Chinese].

Environmental and experimental factors affecting the germination percentage, in particular germination in the panicle, of a series of Taiwan varieties are described. It is noted that resistance to germination in the ear is associated with a long after-ripening period. Heteroauxin treatment at 0·005% for 28 hr. improved the germination percentage of varieties with low germinability at harvesting but inhibited germination of varieties with high germinability at this stage. Varietal differences in dormancy period are believed to be the resultant of differences in hardiness of pericarp, embryonic dormancy and possibly hormone content.

* Presumably Norin 110 is intended.

394 Seko, H., Samato, K. & Sugimoto, K.
**(The relation between varietal characteristics in rice grown late in the season and the number of days in the nursery).**
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 16–29. [Japanese].

Fourteen varieties were studied; the duration of the nursery period varied between 20 and 50 days. Transplantation was effected on 26 July or 5 August in contrast to the usual date towards the end of June. In general, the relative order of heading of the varieties was unaffected by late cultivation. However, in the case of varieties from the Tohoku region, comprising the northern part of the island of Honshu, seedlings transplanted after 30–40 days in the nursery showed a tendency towards premature heading.

395 Sakai, K.-I. & Niles, J. J.
**Heritability of grain shedding and other characters in rice.**
Trop. Agriculturist 1957 : **113** : 211–18.

Based on $F_2$ and $F_3$ data from (1) Pachchai perumal 2462/11 x Vellai illankalayan 28061 and (2) Panduruwi x Vellai illankalayan, heritability values were determined for grain shedding, panicle length and plant height. Shedding was assessed by running a glass roller over each of the panicles placed on an inclined board. Heritability was fairly high for plant height but low for shedding and panicle length. Selection in the case of the two last-mentioned characters may therefore be ineffective in the $F_2$ and should be postponed until later generations. The number of effective factors controlling shedding was estimated as 6 in cross (1) and 2 in (2). Panicle length and plant height in (1) were respectively governed by 11 and 3 factors.

396 Nagamatsu, T. & Omura, T.
**(Compatibility between new strains raised from intersubspecific hybridization of rice and the two parental types).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 13–16. [Japanese].

A collection of 18 $F_{11}$ and 9 $F_{12}$ *japonica* x *indica* hybrids was used. The hybrids were back crossed to both of the original parental types and the fertility of the $F_1$ plants was determined. In all cases but one, mean $F_1$ fertility exceeded 85% in crosses to the *japonica* parent and was less than 45% in crosses with the *indica* parent. In the exceptional case of strain 18, the above values were 52% and 87% respectively.

397 Morinaga, T. & Kuriyama, H.
**Intermediate type of rice in the subcontinent of India and Java.**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 253–59.

Using 12 Japanese varieties, 6 aus and 7 aman varieties from East Pakistan and 8 bulu and 6 tjereh varieties from Java, crossings were made between all the varietal groups to ascertain the degree of fertility of the $F_1$ hybrids and hence the affinities of the groups. The aus varieties and probably the bulu rices show hybrid affinity both with the Japanese rices, on the one hand, and the aman and tjereh rices, on the other. The aman and tjereh rices show mutual affinity, but both produce relatively infertile hybrids with Japanese rices. With regard to the phenol reaction of the grain, Japanese, aus and bulu varieties usually show a negative reaction while the aman and tjereh forms develop coloration. The grain of the Japanese rices is most affected by KOH solution; the bulu and tjereh varieties show an intermediate response; while the aus and aman types are least affected. It is concluded that whereas the Japanese varieties can be assigned to var. *japonica* and the aman and tjereh forms to var. *indica*, a new group, designated the Intermediate type, must be established for the aus and bulu varieties.

398 Sen, P. K. & Mitra, G. N.
**Inheritance of photoperiodic reaction in rice.**
Nature, Lond. 1958 : **182** : 119–20.

With a view to eventually combining the early harvesting of summer varieties with the high yield and good grain qualities of winter varieties, investigations on the mode of inheritance of photoperiodic response have been initiated at the Department of Agriculture, University of Calcutta. $F_2$ plants from crosses of the summer varieties Charnock and Dhairal with the two winter varieties Patnai 23 and Bhasamanik were intermediate between their parents in time of flowering. Hybrid vigour was shown in respect of characters such as height, tiller number and yield.

## FORAGE GRASSES

399 Ovčinnikov, B. F.
**(The breeding work with perennial forage plants).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 28–31. [Russian].

Articles by Konstantinova and Lubenec are criticized for the viewpoint that selection of productive forms within populations of grasses or leguminous forage plants results in reduced yield [XXVIII, 558 and 1756]. In support of his argument the writer mentions some Soviet varieties of timothy, lucerne, clover and sainfoin obtained by mass or single plant selection which outyield the initial populations. Among the 1956 standard varieties of perennial forage plants, 101, nearly half the total number, are said to be selections.

400 Whyte, R. O.
**The grassland and fodder resources of India.**
Sci. Monogr. Counc. agric. Res. India 1957 : No. 22 : Pp. 437.

Chapter XIV of this extensive review is concerned with plant breeding and seed supplies. Attention is being given in India to the development of short-term fodder plants, and in particular legumes, which may be incorporated into existing crop rotations; in this connexion mention is made of the work of the Department of Agriculture of Uttar Pradesh on *Phaseolus aureus* and cowpea. In New Delhi, promising results were obtained in the breeding of *Mucuna cochinchinensis* and *M. deeringiana*; within *Dichanthium annulatum*, a range of forms, which include leafy types suitable for grazing and cutting, has been found. Complex breeding techniques for pasture species have not yet been evolved, more information being required on the ecology and agronomic characteristics of these plants. Species which have been chosen for preliminary work by the Indian Agricultural Institute are listed and the breeding objectives are outlined. Studies of the fertility relationships of a number of species are in progress. Introduced species are being investigated at the College of Agriculture, Dharwar, Bombay; yield trials were carried out. Selection of high yielding types of *Dichanthium annulatum* is also under way in Bombay and types of *Indigofera glandulosa* and *Alysicarpus rugosus*, which are leafy, palatable, have a long period of growth and seed profusely, were selected. Interspecific hybridization with *Pennisetum* was carried out. The College of Agriculture, Nagpur, Madhya Pradesh, has a breeding programme for fodder grasses involving selecting for palatability, high nutritive value, extensive root system and spreading or profusely tillering shoot growth for soil conservation purposes, capacity to withstand trampling, grazing or cutting, capacity to compete with undesirable grasses and drought resistance. Breeding of fodder plants is also being carried out in Sirsa in the Punjab.
There is a further chapter containing descriptions of grasses and legumes now grown in India.

401 Horrell, C. R.
**Herbage plants at Serere Experiment Station, Uganda 1954–1957—I : grasses.**
E. Afr. agric. J. 1958 : **24** : 41–46.

Notes are provided on about 40 grass species. Eighteen introductions of *Chloris gayana* were studied; SR5316 was superior to the others in productivity, leafiness and palatability. A giant variety, SR5560, of *Cynodon plectostachyus* is being bulked for use in long term leys or permanent pasture in fertile areas; it is drought-resistant and produces a small amount of seed of good quality. A vigorous type of *Melinis minutiflora* has recently been selected and will be tested. Considerable variation has been found between strains of *Brachiaria brizantha*; SR545 is a semierect type which is both productive and drought resistant. No good seeding strains of this species are known. The species *Cenchrus ciliaris* is considered to be worth developing, especially for dry areas; much variation in form and productivity was found within the species. A number of strains of *Panicum maximum* are being tested; this species is considered to be one of the most promising for use in leys. Mention is made of a fine-leaved strain of *Paspalum notatum* which is promising as a lawn grass. Selections of *Hyparrhenia rufa* are being made for leafiness and late flowering; this grass is highly productive and palatable. Several varieties of *Pennisetum purpureum* are being tested; it is thought that this grass may be useful for dry season grazing. Twenty-one forms of *Setaria sphacelata* and *S. splendida* were studied; those of *S. splendida* were palatable and productive but the seed was often infected with fungus and subject to depredation by birds.

402 Hein, M. A.
**Registration of varieties and strains of grasses.**
Agron. J. 1958 : **50** : 399–401.

The following varieties, registered by the US Department of Agriculture in cooperation with

the American Society of Agronomy, are described: *Agrostis palustris* 'Penncross' and 'Pennlu'; *Bromus catharticus* 'Lamont' [XXVII, 4084]; *B. inermis* 'Southland' [XXIV, 1153] and 'Saratoga'; *Festuca rubra* 'Pennlawn' [XXVII, 1872]; *Bouteloua curtipendula* 'Coronado' [XXVI, 3414]; *Paspalum notatum* 'Tifhi 1'; *Phleum pratense* 'Essex'; and *Panicum virgatum* 'Caddo' [XXVI, 3410].

The two varieties of *A. palustris* are recommended for specialized turf purposes. Penncross Creeping is a first-generation synthetic produced by random crossing of three vegetatively-propagated clonal strains.

Saratoga is a synthetic developed from five relatively self-incompatible clones. Recommended for New York State and adjacent areas with similar conditions, it shows superiority in seedling vigour, earliness of spring growth and total and aftermath yields.

Tifhi 1, developed at the Georgia Coastal Plains Experiment Station, is an $F_1$ hybrid between two self-sterile and cross-fertile clones, 14 and 108. It has surpassed commercial Pensacola Bahia grass in dry-matter yield and in tests of gain of weight of grazing livestock.

Essex, a synthetic bred at the Department of Plant Breeding, Cornell University, NY, is 2 weeks later in maturity than common timothy and 10 days later than Climax. It is highly leafy and more tolerant of foliage diseases than earlier varieties.

403 **The Aberystwyth strains of grasses and clovers.**
Leafl. Welsh Pl. Breed. Sta. 1958 : No. 6 : Pp. 17.

Information is given on the origin and main characteristics of the following commercial strains bred at the Welsh Plant Breeding Station, Aberystwyth, during the period 1919 to 1957: perennial ryegrass, S23, S101 and S24; Italian ryegrass, S22; cocksfoot, S143, S26 and S37; timothy, S50, S48 and S51; *Festuca pratensis* 'S53' and 'S215'; *F. rubra* 'S59'; *F. arundinacea* 'S170'; white clover, S100, S100 Nomark and S184; and red clover, S123 and S151.

404 Zürn, F.
Mineralstoffgehalt von Gräserarten und Gräsersorten. **(The mineral content of grass species and varieties).**
Phosphorsäure 1958 : **18** : 86–98.

Differences with respect to P, K and Ca content were noted between six grass species and between varieties within the species, all the grasses having had similar fertilizer treatment. In general, the highest yielding varieties had the highest mineral contents.

405 Beddows, A. R. & Jones, L. I.
**Grasses in winter. 1. Observations at Aberystwyth. 2. Suggestions regarding winter herbage.**
J. Brit. Grassl. Soc. 1958 : **13** : 170–76.

Some strains of several grass species are mentioned for their resistance to winter leaf-burn during cold winters at Aberystwyth.

406 Hovin, A. W.
**Reduction of self-pollination by high night temperature in naturally self-fertilized *Poa annua* L.**
Agron. J. 1958 : **50** : 369–71.

Investigations briefly reported elsewhere are described in detail [XXVIII, 1322].

407 **Heaviest bluegrass seed superior.**
What's New Crops Soils 1958 : **10** : No. 8 : p. 28.

At the Kentucky Experiment Station, it was found that selections of *Poa pratensis* with a high seed weight of 22 pounds per bushel were superior to selections with lighter seeds in germination, number of seedlings produced and seedling vigour. Eleven of the heavy-seeded selections surpassed commercial strains in seed production, yield of forage and resistance to rust and invasion by crabgrass.

408 Zohary, D. & Ashkenazi, I.
**Different frequencies of supernumerary chromosomes in diploid populations of *Dactylis glomerata* in Israel.**
Nature, Lond. 1958 : **182** : 477–78.

Examination of three populations suggested that supernumeraries may have different selective advantage in dissimilar ecological habitats.

409 Bradshaw, A. D.
**Natural hybridization of *Agrostis tenuis* Sibth. and *A. stolonifera* L.**
New Phytol. 1958 : **57** : 66–84.

By means of a morphological index and data on pollen fertility, an analysis was made of natural mixed populations of the above two species from an old grazing meadow situated near Oxford, England. Over a large central area of the meadow, plants indistinguishable from artificial $F_1$ hybrids were very abundant, to the virtual exclusion of the parent species. A more elaborate morphological analysis and cytological investigation confirmed this finding and suggested that a small percentage of the plants belonged to the $F_2$ and back-cross generations. The success of the hybrids is attributed to their

growth habit, in which the spreading ability of *A. stolonifera* is combined with the high density of tillers of *A. tenuis*. Under grazing conditions the high degree of sterility of the hybrids is not a disadvantage. Further work is required to determine the amount of gene flow, if any, occurring in general between the two species in the British Isles.

410 Camus, A.
**Un *Bromus* hybrid des dunes du Cotentin. (A *Bromus* hybrid from the dunes of Cotentin).**
Bull. Mus. Hist. nat., Paris : Ser. 2 : 1957 : **29** : 184–85.

A description and Latin diagnosis of *B. jansenii* is given. Found on dunes among *B. mollis* and *B. thominii*, it is thought to be a hybrid between these two species. Its fertility is very low.

411 Schertz, K. F. & Randolph, L. F.
**A collecting and smearing procedure for root tips of *Bromus inermis* Leyss.**
Agron. J. 1958 : **50** : 345–46.

The collecting procedure involves potting tillers in vermiculite in the greenhouse and keeping them at a day temperature of 25° C. and a night temperature of 15° C., with frequent watering. When the roots are $\frac{1}{8}$–1″ long, water at 30° C. should be used for the final watering and the roots collected 2 hr. later. The excised roots, with root caps removed, are pretreated in 0·0015 M 8-hydroxyquinoline solution at 12° C. for 5 hr. and fixed in 3 pts. 95% alcohol: 1 pt. glacial acetic acid. Prior to staining with leuco-basic fuchsin, maceration with 1% pectinol (pectinase) solution at 45° C. for 3 hr. followed by hydrolysis in 1 N HCl at 60° C. for 16–24 min. is effected. The root tips are then smeared in 45% acetic acid.

412 Sigurbjörnsson, B., Mochizuki, A. & Truscott, J. D.
**Studies on the cytology of bromegrass, *Bromus inermis* Leyss.**
Canad. J. Pl. Sci. 1958 : **38** : 111–17.

A survey of somatic chromosome numbers of several strains of both northern and southern types grown in Canada and the USA shows a considerable degree of aneuploidy. A range of chromosome number from 54 to 58 was found, the higher number predominating in the northern and the lower in the southern types. One individual with 49 chromosomes was found. Plants with 55 and 57 chromosomes were comparable to the 56-chromosome plants in seed setting ability; those with 49, 54 and 58 were below average in this respect. Further selection of northern-type strains may bring about a simultaneous selection of plants with additional chromosomes.

413 Schertz, K. F. & Murphy, R. P.
**Fertility in relation to chromosome constitution and behaviour in *Bromus inermis* Leyss.**
Agron. J. 1958 : **50** : 372–76.

A detailed account is given of investigations already briefly reported [XXVIII, 1344].

414 Cooper, J. P.
**The effect of gibberellic acid on a genetic dwarf in *Lolium perenne*.**
New Phytol. 1958 : **57** : 235–38.

In a dwarf type due to a single recessive gene (*d*), cell elongation in the leaf blade and sheath is severely reduced so that a small rosette is formed. Application of gibberellic acid brought the dwarf within the normal phenotypic range for nearly all characters.

415 Jain, H. K.
**Nuclear differentiation in binucleate pollen mother cells.**
Curr. Sci. 1958 : **27** : 174–76.

Twenty per cent of the pollen mother cells of a plant of *Lolium perenne* which had been kept at 34 ± 1° C. for 72 hr. before fixation were binucleate; a central and a peripheral nucleus occurred in each cell. The latter nucleus had chromosomes which showed no organized structure in early prophase; the staining ability did not improve and the chromosomes eventually disintegrated. Chromosomes of the central nucleus formed univalents; there was no anaphase separation and one or more restitution nuclei were formed. A well developed nucleolus was observed in the central nucleus but no nucleolus developed in the peripheral nucleus. An asymmetrically placed premeiotic spindle is thought to be responsible for the position and form of the peripheral nucleus. A cytoplasmic gradient in respect of the nuclear-forming substances is considered to be responsible for the nonsynchronized development of the two nuclei. It is also suggested that nucleolar synthesis and chromosome synthesis are related activities influenced by the same cytoplasmic gradient.

416 Watson, P. J.
**The distribution in Britain of diploid and tetraploid races within the *Festuca ovina* group.**
New Phytol. 1958 : **57** : 11–18.

It is shown that in cultivation the diploid and

tetraploid races correspond broadly to *F. tenuifolia* ($2n = 14$) and *F. ovina* ($2n = 28$), although it is not always possible to allocate individual plants to their respective taxonomic groups on account of the overlapping of diagnostic characters. The evidence from crossing experiments indicated that the cytological races constitute separate breeding entities. The tetraploid populations are predominant in the south and west of the British Isles, whereas only diploids are found in the north of Scotland and diploids are relatively common in the east and south-east of England. Each chromosome race appears to be tolerant of a wide range of ecological conditions within the areas in which it predominates. Distributional data suggest that the tetraploid form is continuing to become more prevalent at the expense of the diploid.

417 Porter, H. L. (Jun.)
**Rhizomes in tall fescue.**
Agron. J. 1958 : **50** : 493–94.

*Festuca arundinacea* has been regarded as non-rhizomatous. Plants with rhizomes have however been discovered at the US Soil Conservation Service Plant Materials Center, Big Flats, NY. The rhizomes of most of the plants had short internodes but variation was sufficient to suggest that selection might result in a more rapidly creeping type. The practical advantages of a rhizomatous strain are pointed out.

418 Bashaw, E. C. & Forbes, I. (Jun.)
**Chromosome numbers and microsporogenesis in Dallisgrass *Paspalum dilatatum* Poir.**
Agron. J. 1958 : **50** : 441–45.

The common, purple-anthered type of *P. dilatatum* and a closely related yellow-anthered strain, both erect in habit, had $2n = 50$, with $10_{I} + 20_{II}$ at metaphase I. A semiprostrate, purple-anthered type with $2n = 40$ was highly irregular meiotically, frequently having 20 laggards at anaphase I. A yellow-anthered, erect strain with pubescent spikelets had $2n = 40$ and regular meiosis. Maintenance of a constant chromosome number in the common and semiprostrate types in spite of highly irregular meiosis, and the relative uniformity of their progeny morphologically, suggest some form of apomixis. According to the cytological evidence, the two last-mentioned types are hybrid in origin. The yellow-anthered strain with pubescent spikelets may have been one of their ancestors.

419 Hartley, W.
**Studies on the origin, evolution, and distribution of the Gramineae. I. The tribe Andropogoneae.**
Aust. J. Bot. 1958 : **6** : 116–28.

From an examination of about 300 floras and floristic lists, a map indicating the general distribution of the Andropogoneae throughout the world has been prepared, by calculating the percentages of species of the tribe in the total grass floras in the different regions. The map indicates that (1) representatives of the tribe are concentrated in the tropical and subtropical regions, (2) Indo-Malaysia is the area with the maximum abundance of species, the greatest concentrations being in western India and southern Indonesia, and (3) the percentage of species falls off rapidly in passing from the tropical to the temperate zones and is lower in the western than in the eastern hemisphere. In the tropics and subtropics the abundance of members of the tribe is closely associated with high midsummer rainfall, while in the temperate regions winter temperature is of particular significance. In general, the geographical survey supports conclusions reached concerning the origin and evolution of the Andropogoneae on the basis of taxonomic and cytological evidence, but gives greater emphasis to the role of climatic factors.

420 Kneebone, W. R.
**Heritabilities in sand bluestem (*Andropogon hallii* Hack.) as estimated from parental clones and their open-pollination progenies.**
Agron. J. 1958 : **50** : 459–61.

The following sets of information were used to estimate the heritability of plant height and diameter: (1) analyses of variance among parent clones, (2) analyses of variance among their open-pollinated progenies, (3) parent-progeny correlations and regressions and (4) correlations between years and between localities. Information on leafiness was available from (1), (2) and (3) and on protein percentage in the leaves from (1). The overall heritability values obtained suggested that selection would be effective for height, diameter, leafiness and protein content, in that order.

421 Celarier, R. P.
**Cytotaxonomy of the *Andropogoneae* II. Subtribes *Ischaeminae, Rottboelliinae*, and the *Maydeae*.**
Cytologia, Tokyo 1957 : **22** : 160–83.

Continuing his study of the Andropogoneae

[XXVIII, 4293], the author surveys the literature on the cytology of genera belonging to the above subtribes and incorporates some information obtained from his own investigations. In the Ischaeminae and Rottboelliinae, $x = 5$ (or 10), 7 and 9 while in the Maydeae, $x = 5$ (or 10) and 9. Polyploidy occurs with respect to each basic number. Of the 35 genera representing the three subtribes, only 19 have so far been studied cytologically. Information on the cytology of two of the genera of the Rottboelliinae, viz. *Lasiurus* and *Hackelochloa*, is reported for the first time. Phylogenetic relationships between and within the subtribes are discussed on the basis of both cytological and morphological features but no conclusions are reached in view of the inadequacy of the available information. It is considered that a thorough study of the genus *Ischaemum* is particularly desirable as a means of elucidating phylogenetic problems.

422 KADAMOV, S. K.
**(An experiment on hybridization of Džugara sorghum).**
Životnovodstvo (Animal-Husbandry) 1957 : No. 3 : 79–82. [Russian].

Three productive forage types of the above kind of sorghum, differing mainly with regard to the shape of the inflorescence, have been selected among the progeny of Horaki x Supergi Džugara in Uzbekistan. They yield 36, 42 and 50 c. grain and 1652, 1526 and 1230 c. green matter per ha. respectively and are suitable for silage.

423 CARLSON, I. T.
**Inheritance of hydrocyanic acid production in crosses between sorghum and Sudangrass.**
Agron. J. 1958 : **50** : 302–06.

Studies were made of crosses between the Sudan grass strains Tift, Sweet, Wis.109 and Wis.1174 on the one hand and 19 sorghums on the other. In crosses involving Wis.109, low HCN tended to be dominant. It appeared that low HCN was associated with the following simply inherited characters: green striped ($gs_1$), golden ($g_1$ and $g_2$), yellow leaf tip (*yl*), single-seeded spikelet (*ts*), Chiltex leaf spot and, in the cross Tift x 15, with normal green v. green striped ($gs_2$). There was also a tendency for coarser plants to be higher in HCN. It is suggested that pleiotropy is more probable than linkage in several of these associations.

424 **Better millet from a four-way cross.**
Agric. Res., Wash. 1958 : **7** : No. 1 : p. 11.

Developed by the US Department of Agriculture in cooperation with the Georgia Agricultural Experiment Station at Tifton, the new pearl millet Gahi–1 is the product of interpollinating four inbred lines. It is suitable for summer grazing and is adapted to conditions throughout Georgia and most south-east states and has surpassed the millets now grown in yield of forage. Gahi–1 develops quickly from seed and recovers swiftly after mowing or grazing; from limited grazing studies it appears that Gahi–1 equals Starr in quality.

425 JONES, K.
**Cytotaxonomic studies in *Holcus* I. The chromosome complex in *Holcus mollis* L.**
New Phytol. 1958 : **57** : 191–210.

"Studies have been made of the relative frequency and distribution in parts of Britain of the chromosome races of *Holcus mollis* ($2n = 28, 35, 42, 49$). These show that the pentaploid is the most common race and that the distribution of the races as a whole is a reflection of varying degrees of adaptability to moisture content of the soil.

"Chromosome studies at meiosis and mitosis show that the tetraploid is an allopolyploid and that the hexaploid is derived from it. The pentaploid appears to be derived from a hybrid of *H. lanatus* ($2n = 14$) and *H. mollis* ($2n = 28$).

"The hybrid nature of the pentaploid is confirmed by the discovery of natural triploid hybrids ($2n = 21$) from which it is presumed to have been derived by backcrossing to the tetraploid parent.

"With the exception of the tetraploid, the races of *H. mollis* reproduce almost exclusively by vegetative means. The tetraploid is fertile but is also likely to reproduce mainly by rhizomes.

"The success of the pentaploid is attributed to its hybrid vigour in both growth and adaptability to soil moisture. In addition its spread is favoured by the fact that its tetraploid parent does not offer much seed competition in the colonization of new areas. There is no competition from the *H. lanatus* parent which has different ecological requirements.

"It is considered feasible that the vigorous pentaploid could eventually supersede the other races of *H. mollis*." [Author's summary].

426 WILSON, F. D.
**A cytotaxonomic study of the genus *Sitanion* (Gramineae).**
Diss. Abst. 1958 : **18** : Publ. No. 25,068 : p. 41. (Abst.)

Five taxa are recognized: *S. hordeoides*, *S. hystrix* var. *californicum*, *S. hystrix* var. *hystrix*,

*S. jubatum* and *S. longifolium*. An attempt was also made to clarify the nomenclatural status of certain *Elymus* x *Sitanion* and *Agropyron* x *Sitanion* hybrids which have been given specific recognition in the past. All the taxa of *Sitanion* have $2n = 28$ and are essentially similar in caryotype. Some consistent differences in chromosome morphology between taxa were however observed. The results of crossing taxa ranged from the production of vigorous, fertile hybrids to complete failure in seed set. Evidence was also obtained of barriers to crossing between races of a single taxon. Hybrid weakness and sterility occurred in combinations both between and within taxa. It is pointed out that differences between taxa are not always clear-cut because of introgressive hybridization.

427 Hansen, J. E. & Dewey, D. R.
**Mass hybridization techniques as applied to standard crested wheatgrass, *Agropyron desertorum* (Fisch.) Shult.**
Agron. J. 1958 : **50** : 393–95.

Further details are given of investigations briefly reported elsewhere [XXVIII, 3077]. Twenty-four highly cross-fertile clones were used in an evaluation of six methods of pollination applied to nonemasculated spikes in parchment bags. Circulation of the air in the bags daily during anthesis proved to be the most effective method, seed yields comparable with those resulting from open pollination being obtained. The air was circulated by blowing orally through rubber tubing inserted in the mouth of the bag. The relative effectiveness of detached and intact spikes as pollinators under bagged conditions, when used in conjunction with hot-water emasculation, was also determined. Hot-water emasculation at 47° C. for 5 min. probably inactivated over 66% of the pollen. The same treatment rendered 25% of the ovaries nonfunctional. Use of detached ♂ parents, or of detached culms of both parents, caused a considerable reduction in seed yield. Tap water and solutions of 0·0002 N $H_2SO_4$ + 0·0002 N $H_3PO_4$ and 0·00002 N $H_2SO_4$ + 0·00002 N $H_3PO_4$ were about equal in their ability to maintain detached culms.

## LEGUMINOUS FORAGE PLANTS

428 Armstrong, J. M.
**Induced polyploidy. What does it offer for improving forage crops?**
Res. Frmrs., Ottawa 1958 : **3** : No. 3 : 10–11, 14.

After brief explanations of the terms polyploid, autoploid and amphiploid, the experimental production of polyploids using colchicine is described. Problems in the production of tetraploid clovers are discussed and the characters of tetraploid red and Alsike clover strains described. Mention is briefly made of the use of polyploidy in the improvement of other crops.

429 Böjtös, Z.
A növénynemesítés és a megporzó rovarok. (**Plant breeding and insect pollinators**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1956 : **9** : 401–08.

A general survey of studies of the pollination of field crops, especially lucerne, by honey bees and wild bees in various countries is presented.
In Hungary, marked increases in the fertilization of red clover by honey bees were obtained after feeding the bees with syrup scented with red clover flowers. Breeding aims include (1) selection of self-fertilizing biotypes from outbreeding species, for use in areas where insect pollinators are scarce and (2) the development of honey-bee pollinated plants from cross-pollinating forms not normally visited by honey bees; this work is concerned mainly with lucerne.

430 Dovrath [Dovrat], A. & Yakir, I. [Y.]
(**Observations on lucerne varieties**).
Sadeh (Field)/Hassadeh 1957 : **38** : 138–42. [Hebrew].

Data on yield, aftermath and flowering date are recorded from trials of numerous introduced varieties. The variety African from California is mentioned for its high yield of green matter and good aftermath growth. Yield and aftermath were strongly correlated.

321 Lubenec, P. A.
(**Lucerne breeding in Canada**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 74–78. [Russian].

An account of breeding research, together with descriptions of the principal varieties grown in Canada, is given.

432 Andrukovič, V. I.
(**The importance of the selection method in breeding perennial forage plants**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 12–17. [Russian].

An article by Lubenec [XXVIII, 1756] is criticized for underrating selection as a breeding

method with such plants as lucerne and sainfoin. All methods of improving these plants are said to involve artificial selection at some stage or other, whether the final result is a land variety, a hybrid population or a cultivar and whether cultivated, wild, local or introduced material is employed.
Some common populations and standard varieties of the above kinds are named. It is admitted that possibilities for the use of mass selection in lucerne and other plants long in cultivation may finally be exhausted. This cannot be said now of sainfoin, where, as in the case of some Caucasian populations, mass selection has only just begun. Mention is made of a few sainfoin varieties selected from Sisian and Nahičevan' populations and the high yielding population Ahalkalakskij Gibridnyj [Hybrid Ahalkalak] and Vysočajšij [Tallest], both obtained by mass selection from Ahalkalak.

433 Møller Nielsen, H.
**Studies on fertility in lucerne and the relation between self-fertility and crop yield.**
Årsskr. K. Vet.- o. LandbHøjsk., Kbh. 1958 : 48–63.
Pod set and seed set were determined in Denmark in selfed, crossed and untripped lucerne plants, mostly selections of the variety Du Puits, over the period 1953–56. Pollination was effected in the greenhouse. Crossing resulted in 3–5 times as many seeds as selfing, the difference being due to increases in both pod number and seed number per pod. Comparisons of plants selected for high and low seed setting ability showed that the former tended to be more self fertile as well as able to set more pods after open pollination. The highly significant positive correlations generally found between pod and seed set, particularly after selfing, and between seed set and seed per pod indicate that after selfing, number of pods or number of seeds per pod may be used as criteria for seed setting; after crossing, number of seeds per pod was the best measure of fertility, while in untripped plants number of pods was best. The relation between pod set and number of seeds per pod was small and variable. Correlations between self fertility, cross fertility and fertility without tripping were small ($r = 0{\cdot}24$–$0{\cdot}44$) but highly significant. A correlation of $r = 0{\cdot}74$ was found between self fertility in the greenhouse and in the field, using the same individuals. The correlations between self fertility in 1957 and 1953–56 were small and variable with an average highly significant value of 0·30. Small positive correlations occurred between self fertility and seed yield and small negative correlations between self fertility and hay yield, the latter determined at the seed stage. No significant correlations were detected between self fertility in parents and the vigour and seed set of the progeny.

434 Crowder, L. V., Michelin, A. & Baird, G. B.
La producción de alfalfa en Colombia. III.—Respuesta de las variedades de alfalfa a las aplicaciones de bórax. **(Lucerne production in Colombia. III. The response of lucerne varieties to applications of borax).**
Agricultura trop. 1958 : **14** : 421–24.
A comparative trial involving six varieties showed that marked differences existed between varieties in respect of tolerance of boron deficiency and in response to boron applications to the soil. Rhizoma was most tolerant of low levels of boron.

435 Ribaldi, M. & Panella, A.
**On bacterial wilt of alfalfa (*Medicago sativa* L.) caused by *Corynebacterium insidiosum* (McCull.) Jensen, in Italy.**
Euphytica, Wageningen 1958 : **7** : 179–82.
Lucerne was attacked by bacterial wilt for the first time in Italy during 1957. Breeding for resistance has therefore been initiated at the Agricultural College of the University of Perugia, using Atlantic and other varieties from the USA as sources of resistance.

436 Stanford, E. H., Goplen, B. P. & Allen, M. W.
**Sources of resistance in alfalfa to the northern root-knot nematode, *Meloidogyne hapla*.**
Phytopathology 1958 : **48** : 347–49.
In greenhouse tests of 21 varieties of *Medicago sativa*, five related *Medicago* spp., 54 introductions of *M. sativa* and 200 lines from breeding material developed in California, only Vernal and the local lucerne Hilmar included individual plants with a high degree of resistance to a virulent isolate of *M. hapla*. This resistance proved to be heritable.

437 **Aphid-resistant alfalfa variety is Kansas goal.**
What's New Crops Soils 1958 : **10** : No. 9 : p. 31.
A synthetic lucerne variety built up from selections from Buffalo resistant to the spotted aphid has given excellent results in Kansas,

showing greater resistance than either Lahontan or Moapa.

438 Coffindaffer, B. L. & Burger, O. J.
**Response of alfalfa varieties to day-length.**
Agron. J. 1958 : **50** : 389–92.

Narragansett, Vernal and Williamsburg, grown alone and with cocksfoot in pots in the greenhouse, were subjected to photoperiods of 16, 14 and 10 hr., data being obtained on dry-matter content, leaf-stem ratio, height, root weight and content of nutrient elements. Some differential varietal responses are reported.

439 Falkowski, M.
O możliwości szerszego wykorzystania w praktyce rolniczej i łąkarskiej niektórych podgatunków i odmian koniczyny czerwonej i białej. (**On the possibility of the wider exploitation of some subspecies and varieties of white and red clover in agricultural practice and grassland management**).
Postępy Nauk Roln. 1954 : **1** : No. 2 : 57–63.

Descriptions of some botanical varieties and forms of red and white clover are presented together with data on their yields in Poland in the years 1948 and 1949.

440 Vestad R. & Skaare S.
Forsøk med utenlandske rødkløverstammer. (**Trials of foreign strains of red clover**).
Forskn. Fors. Landbr. 1958 : **9** : 221–32.

Strains from Sweden, Finland, Denmark and Canada, tested at stations in Hedmark and Akershus, Norway, during 1939–56 and 1948–56 respectively, showed more vigorous aftermath growth and gave higher total yields in the first year, than the Norwegian strain Molstad. Only Ultuna and Tammisto were as hardy as Molstad and yielded as well in the second year.

441 Diachun, S. & Henson, L.
**Red clover clones as local-lesion hosts for bean yellow mosaic virus.**
Phytopathology 1958 : **48** : 369–71.

As reported earlier, clones of Kenland producing local necrotic lesions when inoculated with the above virus have been isolated [XXVI, 2089]. Clones KyC40, KyC40–1 and KyC40–2 appear to be promising as breeding stock for resistance.

442 Zohary, D. & Katznelson, J.
**Two species of subterranean clover in Israel.**
Aust. J. Bot. 1958 : **6** : 177–82.

Yates and Brittan reported the occurrence of a chromosomal race of *Trifolium subterraneum* with $2n = 12$ in Israel [XXIII, 424]. On the grounds of disparity in chromosome number, differences in morphological characteristics and evidence of effective reproductive barriers, the present writers regard this form as a species distinct from *T. subterraneum* with $2n = 16$, giving it the designation *T. israeliticum*. The new species should prove useful under Mediterranean conditions with early summer drought.

443 O'Loughlin, G. T.
**Clover stunt virus. A resistant variety of subterranean clover.**
J. Dep. Agric. Vict. 1958 : **56** : 385–87, 393.

When exposed to severe infestations of virus-carrying aphids in the laboratory, Tallarook did not develop any symptoms of stunt. Under field conditions in Victoria, the variety has been notable for its high degree of resistance. Some European varieties have also been found to possess varying degrees of resistance. It may therefore be possible to introduce immunity into varieties now in use or to replace some of these with resistant ones, if the virus becomes widespread.

444 Steikhardt, H. & Katzenberger, W.
Ergebnisse mehrjähriger Sortenversuche mit Saatwicken. (**The results of several years of varietal trials with vetch**).
Dtsch. Landw., Berl. 1958 : **9** : 215–17.

The characteristics of three varieties of *Vicia sativa* are described and the results are reported of trials held during 1951 to 1957 in Thüringen.

445 Pumphrey, F. V. & Koehler, F. E.
**Forage and root growth of five sweetclover varieties and their influence on two following corn crops.**
Agron. J. 1958 : **50** : 323–26.

The biennial varieties Spanish, Evergreen and Madrid, tested at Mitchell, Nebr., were similar in yield of dry matter and nitrogen content in first-year and early second-year growth, while the biennial common white sweet clover produced slightly less in the first year but was equal or slightly superior in the second. The annual variety Hubam was superior in forage yield but not in nitrogen yield. The biennials were better than Hubam as green manure for two following maize crops.

446 Micke, A.
Mutationszüchtung beim weissen Steinklee (*Melilotus albus*) mit Hilfe von Röntgenstrahlen. [**Mutation breeding in white sweet clover (*M. albus*) with the help of X rays**].
Z. Pflanzenz. 1958 : **39** : 419–37.

The results are reported of experiments carried out at Göttingen where dry seeds of *M. albus* were treated with X rays in doses ranging from 10 to 100 kr. Germinating capacity and the very early stages of development of the $X_1$ seedlings were unaffected by the treatments but in later stages, inhibition of growth and various defects of form were observed. Amongst the $X_2$ progeny, an average mutation rate of 13% was found. In addition to many chlorophyll and dwarf mutants, some new types with characters of possible breeding value occurred. These included fine-stemmed forms of bushy habit; they resembled the Alpha types described by other workers. When compared with Alpha types from Canada, the Göttingen mutant proved to be larger, more vigorous, less woody, and more leafy, the leaves being retained longer. Such forms seemed to be particularly adapted to damp conditions. The bushy character is thought to be controlled by a single recessive character.
Mutants with a low content of coumarin, late shedding of ripe pods or reduced hardness of the testa were also found amongst the $X_2$ plants.

447 Gladstones, J. S.
**Induction of mutation in the West Australian blue lupin (*Lupinus digitatus* Forsk.) by X-irradiation.**
Aust. J. agric. Res. 1958 : **9** : 473–82.

Mutations were induced in *L. digitatus* by X-ray treatment. Most mutations were simple recessives. Of 132 mutants obtained, one early flowering line was established which might be of value. Examination of mutations in the $X_2$ showed that seeds produced in most branch inflorescences of the $X_1$ were descended from a single cell of the irradiated seed, whereas those from apical inflorescences originated from two or more cells.

448 Sváb, J. (Mrs.)
A sárgavirágú csillagfürt nemesítésének jelentősége. (**The importance of breeding yellow lupin**).
Agrártudomány 1958 : **10** : No. 5 : 23–24.

Breeding work leading to the production of yellow, white and blue lupins with low alkaloid content in Hungary and other countries is briefly described.

449 Atabekova, A. I.
**(A spontaneous lupin hybrid).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 2 : 144–46. [Russian].

A natural hybrid of *Lupinus linifolius* ♀ x *L. angustifolius* var. *coeruleus* ♂, found among nursery plants of a lupin collection at the Timirjazev Agricultural Academy is described. Sweet lupins occurred among the segregates in the $F_3$ and $F_4$ and the $F_4$ plants had seed as small as that of *L. linifolius*.

450 Schulz, K.
Der Einfluss der Grösse des Samenkorns auf Entwicklung und Ertrag bei *Lup. albus*. (**The influence of the size of the seed on development and yield in *L. albus*.**).
Z. Acker- u. PflBau. 1958 : **106** : 224–44.

A positive correlation was found between seed size and vigour, height, earliness of flowering and yield. Also it was suggested that, in order to breed for early ripening, types without side branches should be selected.

451 Atabekova, A. I.
[**The dehiscence of the pods in the genus *Lupinus* (Tourn.) L.**].
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.): Otdel. biol. (Biol. Ser.) : 1958 : **63** : No. 1 : 89–98. [Russian].

Anatomical and morphological characteristics of the pod which control dehiscence are described and breeding for anatomical characteristics associated with indehiscence is recommended as a quicker and more reliable method than direct selection for indehiscence in general.

452 Troll, H. J.
Über Vitalitätsverhältnisse bei alkaloidhaltigen und alkaloidarmen Lupinen sowie bei deren Bastarden. (**On vitality relationships in alkaloid-rich and alkaloid-poor lupins and their hybrids**).
Abh. dtsch. Akad. Wissensch. Berlin. 1956 (1957) : No. 7 : 65–76.

In studies carried out at Müncheberg, Germany, the alkaloid-rich *Lupinus luteus* form Schwako yielded more seed and slightly more green matter than forms poor in alkaloids. Three sweet strains with the recessive genes *dul, am* or *lib* were compared with the bitter strain 3535 carrying the nonshedding gene *inv* and with the sweet progeny of their crosses with the latter

as pollen parent. In the bad summer of 1954 the bitter lupins gave far higher yields of seeds than the sweet, but in the better summer of 1955 the difference was less marked except where the sweet lupin was of the *lib* type. The double-recessive lines *dul lib* were lower in yield than the single recessive Weiko III (*dul Lib*) and than *Dul Lib* or *Dul lib* lines. The bitter line Schwako showed less incidence of disease than any of the above sweet forms.
In *L. albus*, sweet x sweet and bitter x bitter $F_1$ hybrids between inbred lines exceeded their parents in pod and seed yield, heterosis being most pronounced in the sweet forms.

453 Kempanna, C. & Sastry, K. S. K.
**Male sterility in *Crotalaria striata***
Curr. Sci. 1958 : **27** : p. 181.

A single male-sterile plant of *C. striata* was found at Hebbal, Bangalore; progeny obtained by open pollination were also male sterile. Hybrids from crosses between sterile and normal plants had luxurious vegetative growth; it is suggested that the male-sterile plants may be useful in exploiting hybrid vigour.

454 Hollowell, E. A.
**Registration of varieties and strains of trefoils (*Lotus* spp.) II.**
Agron. J. 1958 : **50** : p. 402.

*Lotus corniculatus* 'Granger', recently registered in the USA, is described [cf. XXII, 2016].

455 Donovan, L. S.
**Inheritance studies in broadleaf birdsfoot trefoil, *Lotus corniculatus* L.**
Diss. Abstr. 1957 : **17** : Publ. No. 22,129 : 2752–53. (Abst.).

Inheritance of leaf size appeared to be mainly under the control of one locus, dominance being incomplete. Back-cross ratios were indicative of autotetraploid segregation. The two types of seed mottling studied were both dominant to nonmottling. One type depended on two disomically-inherited genes. The number of genes responsible for the other type of mottling was not determined precisely but appeared to be small. The use of mottling as a varietal marker is questionable in view of the influence environmental conditions may exert upon expression of the character. Brown keel tip was conditioned by one dominant gene, which may also be involved in the inheritance of the first-mentioned type of mottling. The parents used were essentially similar in cytology, with the chromosomes pairing chiefly as bivalents.

456 Zanotti, L.
La selezione della sulla. (**Breeding *Hedysarum coronarium*).**
G. Agric. 1958 : **68** : p. 254.

Observations on local strains in different parts of southern Italy have revealed the existence of some promising ecotypes; one of them is very early and can be cut from the beginning of March, ripens seed in early May and yields up to 800 c. of green matter per ha.; others are late, the first cut being at the end of April and the average yields up to 1000 c. per ha.
Attempts to cross the species with *H. flexuosum* and *H. obscurum* have so far been without success.

457 Patil, R. P.
**Chromosome numbers of some dicotyledons.**
Curr. Sci. 1958 : **27** : p. 140.

The following chromosome numbers are given for the first time: *Clerodendrum infortunatum*, $n = 26$; *Albizzia lebbek*, $n = 13$; *Indigofera pulchella*, $n = 8$; *Dalbergia sissoo*, $n = 10$; *Rhizophora mucronata*, $n = 18$; *Croton bonplandianum*, $n = 10$ and *Alstonia macrophylla*, $n = 11$.

458 Gillett, J. B.
***Indigofera* (*Microcharis*) in tropical Africa with the related genera *Cyamopsis* and *Rhynchotropis*.**
Kew Bull. : Addit. Ser. : 1958 : No. **1** : Pp. 166.

A detailed classification is presented of all species of *Indigofera* (including *Microcharis*) known to occur in the areas considered in the Floras of Tropical East Africa and West Tropical Africa and of the projected Flora Zambesiaca. The genera *Cyamopsis* and *Rhynchotropis*, which are easily confused with *Indigofera*, are also dealt with. In the course of the investigations it has been necessary to study most, but not all, of the remaining *Indigofera* spp. of tropical Africa and Arabia, and a number from S. Africa. Several new species and varieties from these areas have been included.

459 Ali, S. I.
**Revision of the genus *Indigofera* L. from W. Pakistan and N.W. Himalayas.**
Bot. Notiser 1958 : **111** : 543–77.

Twenty-six species including two new species and

two new varieties of *Indigofera* are recognized in material from a region comprising W. Pakistan, Kashmir, E. Punjab and Kumaun; a key to the species is provided.

460 Vogt, E.
Die Blütenfarben-Variationen der Serradella (*Ornithopus sativus* Brotero). [**The flower colour variations of serradella (*O. sativus* Brotero)**].
Angew. Bot. 1958 : **32** : 105–10.

Two groups of *O. sativus* are distinguished on the basis chiefly of flower and seed colour. The first comprises four botanical varieties with flowers ranging from white to normal in colour, yellow seeds and a white connective. The second is given subspecific rank, ssp. *melanospermus*, and includes two varieties with red and dark red flowers respectively, black seeds and black connective. Latin diagnoses of the varieties and the subspecies are given.

## ROOTS AND TUBERS

461 Dunne, J. P. & O'Sullivan, T. J. R.
**Fodder beet trials 1951–1954.**
J. Dep. Agric. Éire 1956–57 : **53** : 151–70.

After a brief note on classifications of types of fodder beet adapted in Sweden, Denmark and the Netherlands, yield data are provided for 14 Danish, three Swedish, one Irish and seven English varieties tested at three centres in Ireland with different soil types.

462 Shibutani, S. & Isoda, R.
**(On flower-bud differentiation in turnip varieties).**
Engei Gakkai Zasshi/J. Hort. Ass. Japan 1958 : **27** : 45–48. [Japanese].

The period to flower-bud differentiation after autumnal and spring sowing of 40 varieties grown in Japan was determined. Varieties of the local Japanese type had a markedly shorter period to flower-bud differentiation than those of the western European type.

463 Jähnl, G.
Ergebnisse der Kartoffelversuche des Jahres 1957. (**Results of potato trials of the year 1957**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1958 : No. 42 : Pp. 86. (Mimeographed).

Tabulated information is presented on the yield, starch content, tuber characters and susceptibility to virus and other diseases of potato varieties tested in several localities in the Austrian Alps.

464 Lunden, A. P. & Roer, L.
Sammenlignende forsøk med tidlige potetsorter i årene 1941–1954. (**Comparative trials of early potato varieties in the years 1941–1954**).
Forskn. Fors. Landbr. 1958 : **9** : 173–200.

Data on the performance of 17 varieties tested during 1941–54 in south-eastern Norway are presented, together with an account of the main characteristics of each variety.

**Abstracts of papers presented at the forty-first annual meeting of the Potato Association of America.**
Amer. Potato J. 1958 : **35** : 421–23.

465 *Bonde, R., Akeley, R. & Merriam, D. Progress in the development of ring rot resistant potato varieties.* (*p. 422*).

Seedlings have been developed possessing greater resistance to *Corynebacterium sepedonicum* than the resistant varieties Saranac, Teton and Merrimack; some have remained uninfected through 12 years' successive inoculation. Some of these seedlings are in addition immune or highly tolerant to *Phytophthora infestans* races O, $R_1$, $R_2$ and $R_4$ and progress has been made in combining resistance to ring rot with resistance to common scab, leaf roll and the mosaic diseases. Studies of the inheritance of ring rot resistance are in progress.

466 *Dionne, L. A. A survey of methods for overcoming cross-incompatibility between certain series of the genus* Solanum. (*pp. 422–23*).

Failure to set seed in interspecific crosses was found to result mainly from one of two causes, firstly that only a few ovules are reached by pollen tubes, so that growth of the ovary is not stimulated, and secondly that fertilization cannot occur, since pollen tubes fail to reach the placental tissues. The first difficulty can be overcome by treating the ovary with 3–6 p.p.m. of 2,4-D from 24 to 48 hours after pollination and to overcome the second type of incompatibility a "genetic method" is said to be promising.

467 *Easton, G. D., Larson, R. H. & Hougas, R. W. Immunity to potato virus Y.* (*p. 423*).

Immunity to the above virus has been found in selections of *Solanum stoloniferum, S. antipoviczii, S. tlaxcalense* and in 13 selections from interspecific hybrids. Of the 22 lines tested 19

had virus-Y-immune *S. stoloniferum* as one parent but six of these were susceptible when mechanically inoculated.

468 *Galindo, J. & Gallegly, M. E. Compatibility types in* Phytophthora infestans. (*p. 423*).

Further studies of isolates of *Ph. infestans* [cf. XXVII, 4162] have shown that some isolates may act as male, female or both, depending on the isolate with which they are paired. Such isolates are therefore functionally heterothallic and potentially homothallic and differ in compatibility type, not in sexual morphology.

469 Laurila, K.

*Solanum tuberosum* L. ja *S. demissum* Lindl.-lajien välisten risteytysten $F_1$-polvessa ilmenneestä kasvullisesta muuntelusta. (**On the vegetative variation of the $F_1$ generation of hybrids between *Solanum tuberosum* L. and *S. demissum* Lindl.**).

Maataloust. Aikakausk. 1957 : **29** : 56–67.

Crosses between *Solanum demissum* and *S. tuberosum* 'Ruusulehti' [Rosafolia] and between *S. tuberosum* L. 'Tammiston aikainen' [Early Tammisto] and *S. demissum* were effected in 1947. A large number of clones have been built up from the $F_1$ thus obtained and the range in the vegetive features of these clones has been studied. The characters measured included the anthocyanin content of the flower and tuber, yield, dry weight/fresh weight ratio of the tubers, and frost resistance.

470 Cárdenas, M.

Reunión de técnicos bolivianos para acordar un plan cooperativo de mejoramiento. (**Meeting of Bolivian breeders to resolve upon a cooperative plan for breeding**).

Rev. Agric., Cochabama 1958 : **13** : No. 10 : 36–43.

At the above meeting, held in September 1956, recommendations for further potato breeding work at the breeding stations and the university included extensive interspecific hybridization with the aim of improving disease resistance, frost resistance, adaptability and quality and the maintenance of a collection of wild species. It is noted that promising hybrids have been obtained from crosses between high-yielding commercial varieties and high-yielding native varieties such as *Solanum andigenum* 'Huaca lajra' and 'Sani imilla.'

471 Kawakami, K. & Matsubayashi, M.

**Studies on the species differentiation in the section Tuberarium of *Solanum*. IV. Cytological behaviour of the $F_1$ hybrids from *S. tuberosum* x *S. saltense* (4x), with special remarks on the polyploid nature of *S. tuberosum*.**

Japan. J. Bot. 1957 : **16** : No. 1 : 128–34.

$F_1$ hybrids of *S. tuberosum* 'Deodara' x induced autotetraploid *S. saltense* had a mean configuration of $3{\cdot}72_{I} + 19{\cdot}00_{II} + 1{\cdot}29_{III} + 0{\cdot}60_{IV}$ at metaphase I. At metaphase II, 49·26% of the cells showed a numerically balanced distribution of the chromosomes. The average amount of stainable pollen amounted to 46%. The authors regard their observations on pairing as evidence of allotetraploidy in *S. tuberosum*.

472 Bether, F.

(**Directed changing of the lengths of stolons in interspecific potato hybrids**).

Agrobiologija (Agrobiology) 1958 : No. 1 : 44–55. [Russian].

Methods of reducing the length of stolons in hybrids of *Solanum tuberosum* x *S. leptostigma* and their progenies were studied at the University of Moscow. All the following breeding techniques have given good results: (1) using early varieties or intervarietal hybrids of *S. tuberosum* as the female component in the cross; (2) root feeding of the interspecific hybrids with either sucrose or glucose; (3) sowing the hybrids in summer instead of spring; and (4) inducing development of plants from secondary buds in the $F_1$.

473 Sortenbeschreibung der seit 1955 neu zugelassenen Kartoffelsorten. (**Varietal description of the potatoes newly approved since 1955**).

Dtsch. Landw., Berl. 1958 : **9** : 360–61.

Full descriptions are provided of the varieties Anemone, Amsel [Blackbird] and Drossel [Thrush]; morphological and quality characters and disease resistance are mentioned. Anemone is suitable for forcing, Amsel is a productive early variety of low starch content and Drossel is medium-early, adaptable and suitable for cooking and commercial purposes. [Cf. XXVII, 1917].

474 **Issue on varieties.**

Potato News Netherlands 1958 : **8** : 1–20.

Descriptions, compiled largely from the Nether-

lands 33rd Descriptive Variety List of Agricultural Crops, 1958 [cf. XXVIII, 3574], are given of 8 early, 19 midearly and 27 midlate or late varieties. Data on yield, quality and disease resistance are included together with the names of the breeders or their representatives in the Netherlands. The new varieties Pandora, Herkol and Dekama are included in the list [cf. XXVIII, 4388].

475 Les nouvelles variétés en Belgique. (**The new varieties in Belgium**).
Pomme d. Terre franç. 1958 : **21** : No. 225: p. 15.

Brief notes are provided on seven potato varieties recently admitted to the Belgian Official List. These varieties are Crésus, Gaumaise, Électre, Érato, Eschyle, Érasme and Gari.

476 Žižila, M. I. & Grihutik, M. I.
**(On the land of the Subtaiga Zone).**
Kartofel' (Potato), Moskva 1958 : No. 1 : 6–8. [Russian].

The potato Priekul'skij Rannij [Early Priekuli] is superseding Èpron in places in the Krasnojarsk territory on account of its greater earliness and improved drought resistance. Other promising new varieties are Maria Hrinnikova, a highly productive forage variety, and Ojrotturskij, a potato with a 1–1·5% higher starch content and better flavour than Berlichingen, which it also exceeds in earliness and surpasses in resistance to diseases.

477 **Three new potatoes from North Dakota.**
What's New Crops Soils 1958 : **10** : No. 8 : p. 26.

Norland, Norgleam and Nordak have been released in North Dakota; they are early, high yielding and widely adapted. Norland produces a high percentage of No. 1 tubers with red skin and shallow eyes; the cooking quality is good. It is moderately resistant to scab but susceptible to late blight, common potato viruses and *Spondylocladium atrovirens*. Norgleam and Nordak produce white-skinned tubers with shallow eyes, the cooking quality being particularly high. They are susceptible to pitted and russet types of scab and late blight but resistant to virus Y; also they have been free from *S. atrovirens*. On account of their short stolons, these two varieties are susceptible to sun greening. Norgleam and Nordak only make crisps of acceptable quality after a period of storage and reconditioning.

478 Akeley, R. V.
**Evaluation of potato varieties.**
Amer. Potato J. 1958 : **38** : 517–25.

The author evaluates the commercial status of several old varieties in the USA and of many new varieties released since 1932 on the basis of data on certified seed production in 1956 and information on disease resistance and other characters improving efficiency of production. In the year under consideration, 63% of the certified seed production for the whole of the USA involved 39 new varieties. This percentage represents an increase of 19% for new varieties since 1948.

479 Sanz de Cortázar, C.
Influencia climatérica sobre el polen de papa. (**The influence of climate on potato pollen**).
Agricultura téc., Santiago 1954 : **14** : 5–10.

Percentage of good pollen in six varieties grown in five localities in Chile showed marked intervarietal and environmental differences. Pollen quality was unrelated to temperature or precipitation during the months of flowering, viz. December and January, but was positively related to relative humidity. The most favourable locality was Centinela and the best varieties President and Llanquihuana, both of which produced 8·7% good pollen.

480 Maierhofer, E.
Die "Knollenbildungsperiode" in der Beurteilung von Sämlingen und Kultursorten der Kartoffel. (**The "tuber-forming period" in judging seedlings and cultivated varieties of the potato**).
Z. Pflanzenz. 1958 : **40** : 59–66.

Small scale investigations at the Potato Breeding Station, Kefermarkt, Austria, revealed that the period required for potato tubers to complete their development is a quantity showing varietal differences. A definite correlation was found between the length of the tuber-forming period and the uniformity in size of the tubers; varieties with a long period produced tubers of varying size, the proportion of small tubers in the yield increasing with the length of the developmental period. It is thought desirable that both early and late varieties should have a short tuber-forming period.

481 Hawkes, J. G.
**On the lectotypes of *Solanum stoloniferum* Schlechtendal et Bouché, *S. oxycarpum* Schiede and *S. verrucosum* Schlechtendal.**
Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg 1956/57 : **6** : 849–53.
Lectotypes are designated for the above three species.

482 Ležepekov, S. A. & Filippov, A. S.
**(The method of breeding forage varieties).**
Kartofel' (Potato), Moskva 1958 : No. 2 : 64–66. [Russian].
Interspecific hybridization is the principal method employed at the Potato Institute in breeding for high dry matter and protein contents. Biochemical evaluation of wild species and forms has shown that *Solanum semidemissum* and some forms of *S. andigenum* are especially rich in protein. Chilean forms of *S. tuberosum* are also interesting, especially as they cross easily with domestic varieties. The results obtained include seedlings which have a dry-matter content of up to 33·04% and 3·18% of protein. Among the domestic varieties used for crossing with *S. semidemissum* and other wild species and forms are Pepo, Parnassia, Jubel, Switeź, Tannenberg, Warsaw, Katahdin, Verra, Smyslovskij (= Fürstenkrone), Alma and Rozovaja iz Mileta. They were chosen for their yielding capacity, high starch content, resistance to *Synchytrium* and other good economic characteristics.

483 Komlóssy, Gy.
A burgonyagumó vasfoltossága és a fajtakérdés. **(Potato tuber rust spot and the varietal question).**
Magyartud. Akad. Agrártud. Oszt. Közl. 1955 : **8** : 127–29.
The varieties Gülbaba, K502, Krassawa, Aranyalma [Golden Apple], Wohltmann, Bintje and Warsavianka [potato from Warsaw] are noted as being very resistant.

484 Procenko, D. E.
**(A high yielding *Phytophthora*-resistant seedling).**
Kartofel' (Potato), Moskva 1958 : No. 1 : p. 50. [Russian].
The potato seedling 437s/46 from the Moscow Breeding Research Station is mentioned for its *Phytophthora* resistance and high tuber yield under Habarovsk conditions.

485 **Late blight investigations. Committee report—1957.**
Amer. Potato J. 1958 : **35** : 417–20.
The report of the Late Blight Investigations Committee of the Potato Association of America again emphasizes the increasing importance of breeding for polygenic field resistance, in view of the instability of the pathogen [cf. XXVII, 4160]. Methods of evaluating field resistance are mentioned. At least one further *R* gene has been found in *Solanum demissum* and studies of *S. bulbocastanum, S. pinnatisectum, S. polyadenium, S. stoloniferum, S. morelliforme* and *S. clarum* indicate the presence of genes corresponding to the *R* genes of *S. demissum* while resistance to race 1,2,3,4 has been found in accessions of *S. guerroense, S. oxycarpum, S. polytrichon, S. spectabile, S. verrucosum* and *S. bulbocastanum*. A further isolate of race 1,3,4 of the pathogen has been found in West Virginia attacking some clones resistant to race 1,2,3,4 and has been tentatively designated race 1,3,4,6, indicating the presence of a sixth *R* gene in *Solanum*. Studies of compatibility types of the pathogen are reported elsewhere [cf. XXVIII, 4406]. Work with single oospore cultures derived from crosses between different races indicates that hybridization occurs, giving rise to races differing from the parents.

486 Lipinski, S.
Niektóre zagadnienia metodyki hodowli na odporność przeciwko zarazie ziemniaczanej. **(Some problems of methods in breeding for resistance to potato blight).**
Postępy Nauk Roln. 1954 : **1**: No. 3 : 66–79.
A general discussion of the problems involved is followed by a review of work done at the Central Breeding Station at Zamarte, Poland, during 1949–1954. An investigation was carried out with lines from hybrids obtained by crossing *Solanum demissum* with *S. tuberosum*. Leaves in different stages of growth and tubers were infected with blight. Later healthy plants were selected to obtain a variety resistant to *Phytophthora infestans* in both parts of the plant.

487 Pantjuhina, L. A.
**(The question of breeding *Phytophthora*-resistant varieties).**
Kartofel' (Potato), Moskva 1958 : No. 2 : 62–63. [Russian].
Breeding work with potatoes at the White

Russian Horticultural Institute proved that interspecific hybridization using *Solanum demissum*, *S. leptostigma* or *S. curtilobum* as the resistant species was effective. It was found however that some hybrids initially resistant to the pathogen later succumbed to a more virulent strain; varieties and hybrids that were not immune at the start but were near-resistant under field conditions were less affected later in this way.

The results of breeding include three seedlings which derive resistance from *S. demissum*. Seedling 18–10s/50 is a midseason type combining field resistance to *Phytophthora* with resistance to *Synchytrium*; it outyields the standard variety Zazerskij by 14% and has a 3–5% higher starch content. The tubers are white and their flavour is good. Seedlings 18–9s/50 and 819s/50 have similar properties.

488 Takakuwa, M. & Tomiyama, K.
**(Cytological studies on resistance to potato blight. VI. Measurements of the time taken for browning of the host cells following infection by blight strains differing in pathogenicity).**
Hokkaido Nogyo Shikenjo Hokoku/Rep. Hokkaido agric. Exp. Sta. 1957 : No. 73 : 94–99. [Japanese].

Midribs of detached leaves of the variety Hokkai 10 ($R_1$) were inoculated with strains $H_1$ (= 0) and $H_3$ (= 1) of *Phytophthora infestans*. Cells inoculated by $H_1$ showed typical hypersensitive reactions, including early Brownian movement and browning of the cytoplasm. In the case of $H_3$, to which Hokkai 10 is susceptible, the appearance of particles in Brownian movement and cytoplasmic browning were much later.

489 Driver, C. M.
**Races of potato blight, *Phytophthora infestans* (Mont.) de Bary, in New Zealand.**
NZ J. agric. Res. 1958 : 1 : 527–30.

Race 0 of *Phytophthora infestans* is the most common in New Zealand, but races 1; 1,3; 2; 2,4; 3; and 4 have been shown to be present, often intermixed. Race 0 was also found on the native species *Solanum aviculare* and *S. laciniatum*. Breeding for resistance to specific races is likely to be of less permanent value than the establishment of field resistance.

490 Quevedo Díaz, A.
Nuevas razas fisiológicas del *Ph. infestans* en el país, pruebas de resistencia en variedades, híbridos y seedlings y comprobación de ella en condiciones de campo.
**(New physiological races of *Ph. infestans* in our country, tests of resistance in varieties, hybrids and seedlings and its verification under field conditions).**
Bol. Estac. exp. agríc. La Molina 1958 : No. 70 : Pp. 43 : (Mimeographed).

On the basis of their reaction on 15 differential potato varieties from Scotland and ten from the USA, ten isolates of *Phytophthora infestans* collected in northern and central Peru were found to comprise the physiological races 2; 4; 1,2; 1,3; 2,3; 2,4; 3,4; 1,2,3; 1,2,4; 1,3,4; and 1,2,3,4; of which all but the second, sixth and seventh are new to Peru. Inoculation tests of numerous varieties and seedlings showed that resistance is generally determined by major genes of the *R* series or sometimes also by polygenes. Complete absence of susceptible plants occurred in *Solanum antipoviczii*, *S. demissum* and all but two accessions of *S. stoloniferum*; the first two species are regarded as particularly promising for breeding. Among hybrids which showed resistance under field conditions and which were also good in quality or yield were: *S. antipoviczii* x *S. goniocalyx*, Casa blanca x *S. antipoviczii*, (*S. andigenum* x *S. demissum*) x Maco ojo morado [Purple-eyed Maco] and lines from (*S. andigenum* x *S. demissum*) x (Maco x Ccompis) and *S. demissum* x Huagalina amarilla [Yellow Huagalina].

491 Toxopeus, H. J.
**Some notes on the relations between field resistance to *Phytophthora infestans* in leaves and tubers and ripening time in *Solanum tuberosum* subsp. *tuberosum*.**
Euphytica, Wageningen 1958 : 7 : 123–30.

Observations collected on 268 varieties over a period of many years by Hogen Esch and Zingstra at the Institute for Research on Varieties of Field Crops, Netherlands, provided the data for analysis of the above relationships. Although in general a positive correlation exists between field resistance of the foliage and tubers, quite a large number of varieties are highly susceptible in the leaves but moderately resistant in the tubers. The combination of a high degree of leaf resistance and moderate resistance in the tubers is rare, although it occurs in varieties carrying an *R* gene for hypersensitivity.

Departures from the general correlation between foliage and tuber resistance may in some cases be related to the length of the period during which the sporangia from the foliage are produced and dispersed. The results of preliminary investigations suggest that the skin of the tuber may act as a barrier to penetration by the fungus in many varieties. The reactions of the flesh are however also instrumental in determining degree of tuber resistance. Leaf resistance and lateness of maturity are very closely correlated. Tuber resistance and time of maturity are less closely associated. Possibly the former association may be broken by the use of genes from wild and cultivated South American and Mexican material.

492 Bordukova, M. V. & Belova, O. D.
**(The development of methods of controlling potato diseases by Soviet scientists).**
Kartofel' (Potato), Moskva 1958 : No. 1 : 14–18. [Russian].

Resistance breeding is regarded as the most effective method for controlling *Synchytrium*; a few resistant Soviet varieties bred in recent years are named.

493 Hižnjak, P. A.
**(Our investigations on wart).**
Kartofel' (Potato), Moskva 1958 : No. 1 : 35–36. [Russian].

Extensive material, including the potato collection of the Institute of Plant Industry, has been tested for wart resistance at four research stations especially founded for the study of *Synchytrium* in 1948. Most of the resistant forms which are providing material for resistance breeding are already known.

494 Gedz', S. M.
**(Vegetative hybridization by grafting stolons).**
Kartofel' (Potato), Moskva 1958 : No. 1 : 48–50. [Russian].

The method of grafting wart-susceptible scions on resistant varieties of potato has been previously described [XXVIII, 3160]. A table shows the number of resistant and susceptible seedlings for different graft combinations. All seedlings from Ella/Jubel, Lorh/Ostbote, Lorh/Parnassia and Ėpron/Jubel were wart resistant.

495 Tereščenko, E. F.
**(Utilizing the ability of plants to resist parasites).**
Kartofel' (Potato), Moskva 1958 : No. 1 : 33–34. [Russian].

Among wart-resistant potato varieties tested for resistance to ring rot, Parnassia, Četyrehsotka [Four-hundred] and Borodjanskij proved moderately resistant under conditions of artificial infection at the Nemešaevskaja Research Station. Wohltmann, a wart-susceptible variety, showed the highest degree of resistance to ring rot and transmitted this character to its hybrid progeny, in particular the wart-resistant seedlings 846s/51 (Wohltmann x Rosafolia x Katahdin), 2345/48 and 2829/47. Wohltmann was also unsurpassed by other varieties in resistance to stem nematode, a new wart-resistant variety Katjuša [Little Katja] being next best in this respect.

496 Kühn, H.
Über die Abwehrnekrose eines Kartoffelbastardes gegen den Kartoffelnematoden (*Heterodera rostochiensis* Wr. in *Solanum tuberosum* subsp. *andigena* [Juz. et Buk.] Hwk. x *Solanum tuberosum*. L.) [**The defensive necrotic reaction of a potato hybrid against the potato nematode (*H. rostochiensis* Wr. in *S. tuberosum* subsp. *andigena* (Juz. et Buk.) Hwk. x *S. tuberosum* L.)**].
Z. PflKrankh. 1958 : **65** : 465–72.

It was found that large numbers of larvae of *H. rostochiensis* entered the roots of a nematode-resistant hybrid between the variety Apta and *S. tuberosum* subsp. *andigenum* but did not complete their development. In this hybrid, the meristematic tissues of the roots reacted to the larvae by becoming necrotic, as a result of which the parasites did not receive sufficient nourishment.

497 Prjanišnikova, E. N.
**(Interspecific hybrids of the potato).**
Kartofel' (Potato), Moskva 1958 : No. 2 : 69–71. [Russian].

Hybrids 1021 and 1022 were bred from (*Solanum horovitzii* x *S. tuberosum*) x *S. boergeri* at the Potato Institute. They are more productive of tubers than Lorh and are resistant to diseases, including virulent strains of *Phytophthora* from East Germany. In the trials carried out in the German Democratic Republic they also showed resistance to Colorado beetle. Both hybrids flower and form berries profusely, and have a fairly compact arrangement of the tubers, these being white and large. The starch content of 1021 was 15·4% in 1954 and 20·6% in 1955, and the starch content of 1022, 13·4% and 27·1% respectively. Hybrid 1021 forms tubers early; hybrid 1022 forms them late. Material showing resistance to *Phytophthora* and *Synchytrium* was obtained by crossing *S. demissum*

with *S. tuberosum* and back crossing the hybrids to *S. tuberosum*. A few of these hybrids are resistant to Colorado beetle. A greater number of hybrids resistant to Colorado beetle was obtained from crossing *S. tuberosum* varieties with *S. parodii*, *S. macolae*, *S. laplaticum* or *S. gibberulosum*, but most of these have a low yielding capacity and require improvement by further hybridization.

498 Stottmeister, W.
Untersuchungen über die Abbauwiderstandsfähigkeit der in der Deutschen Demokratischen Republik zugelassenen Kartoffelsorten. (**Investigations on the resistance to degeneration of the potato varieties approved in the German Democratic Republic**).
Dtsch. Landw., Berl. 1958 : **9** : 272–76.

The results are reported of tests carried out at Gross-Lüsewitz during 1951 to 1956 in order to compare the resistance of potato varieties to degeneration caused by leaf roll virus and viruses Y and A.

499 Stottmeister, W.
Untersuchungen über die Toleranz der in der Deutschen Demokratischen Republik zugelassenen Kartoffelsorten gegenüber Viruskrankheiten. (**Investigations on the tolerance towards virus diseases of the potato varieties approved in the German Democratic Republic**).
Dtsch. Landw., Berl. 1958 : **9** : 327–33.

The decline in yield which is to be expected with virus infection is shown graphically for 22 potato varieties studied at Gross-Lüsewitz.

500 Kozłowska, A.
Zagadnienie degeneracji ziemniaka w świetle 6-letnich doświadczeń. (**The problem of degeneration in potato in the light of 6 years experience**).
Postępy Nauk Roln. 1954 : **1** : No. 2 : 11–21.

This article includes evidence, from work in Poland, that susceptibility to viruses X and Y varies with changes in climatic conditions.

501 Oshima, N.
(**On the variation of potato virus X. I. The reaction of host plants**).
Hokkaido Nogyo Shikenjo Hokoku/Rep. Hokkaido agric. Exp. Sta. 1957 : No. 73 : 100–18. [Japanese].

The differential reaction of a series of solanaceous plants and *Gomphrena globosa* to sap inoculation with 20 strains of the virus are described. The strains are associated into three groups on the basis of intensity of symptoms produced. The potato variety Chitose is only infected by some of the strains.

502 Steineck, O.
Die Grundlagen der photoperiodischen Reduktionsauslese bei einjährigen Kartoffelsämlingen. (**The bases of photoperiodic reduction selection in one-year old potato seedlings**).
Z. Pflanzenz. 1958 : **39** : 403–18.

Experiments carried out during summer in Vienna involved subjecting seedlings from the cross Saskia x Flava and from a selfing of Flava to various short photoperiods. The treatment influenced the development of all parts of the plant; in particular, the direction of growth of the stolons was affected. The shorter the photoperiod the greater was the proportion of seedlings which had all their stolons growing into the ground. It was possible to distinguish seedlings with short photoperiodic requirements by the tendency of their stolons to grow horizontally and then upwards during the longer photoperiods; the seedlings with long photoperiodic requirements had stolons which grew downwards under these conditions. It is considered worthwhile for breeders to raise potato seedlings in the greenhouse and to study the direction of growth of the stolons during the longer days of the year; in this way, short-day types, which are unsuitable for central and north Europe, may be easily recognized.

503 Hirai, G.
(**On the transpiration rate of sweet potato varieties and varietal distribution**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop. Sci. Soc. Japan) 1958 : **26** : 252–54. [Japanese].

A comparative study of six Japanese varieties showed that they could be classified into two groups: (1) a group principally grown in north-east Japan, in which the transpiration rate reaches a maximum at 25–26° C; and (2) a group more characteristic of south-west Japan in which the transpiration maximum is at 27–28° C.

## FIBRES

504 Nai Prayote Purnasiri
**Cotton in Thailand.**
Pakist. Cott. 1958 : **2** : No. 3 : 11–12.

A brief mention is made of breeding in progress in Thailand; attempts are being made to produce

varieties of high yield and quality and early maturity. Crosses have been made between Cambodian and American Upland varieties; CM, Cambodian x Mexican Big Boll, matures before Cambodian and withstands dry weather.

505 Niles, G. A., Richmond, T. R. & Elliott, F. C.
**Performance of cotton varieties in Texas, 1954–56.**
Bull. Tex. agric. Exp. Sta. 1957 : No. 877 : Pp. 14.

The results of extensive trials in ten regions in Texas are tabulated and recommendations are made of varieties suitable for each area.

506 Zakirov, K. Z., *et al.*
**(In commemoration of Grigorij Ignat'evič Gavrilov).**
Hlopkovodstvo (Cotton Growing) 1958 : No. 6 : p. 64. [Russian].

This obituary of G. I. Gavrilov of Kara-Kalpakia mentions a series of cotton varieties which he developed. Most are characterized by earliness and good technological properties. Some new early, large-bolled varieties such as KK1576, KK1882 and KK2056 will soon be made available to state and collective farms.

507 Fryxell, P. A.
**Performance of some wide crosses in *Gossypium*.**
Bull. N. Mex. agric. Exp. Sta. 1958 : No. 419 : Pp. 15.

A detailed report is presented of a study carried out at the New Mexico Agricultural Experiment Station of 36 $F_1$ hybrids between varieties representative of *G. hirsutum* and *G. barbadense*, together with the parental varieties. These varieties did not represent uncontaminated species on account of some interspecific introgression having occurred. Data are presented on four characters concerned with productivity and six related to fibre quality.

The combining abilities of the parental varieties are discussed with reference to introgression between the two species and the possible commercial value of the interspecific hybrids. Heterosis in the hybrids in respect of economically important characters was not very marked, except in the case of fibre elongation. However the hybrids tended to combine the desirable characters of both parent species; Pima 32 x Acala 1517C was considered to be outstanding in this respect and suitable for commercial production. The parents of this variety were noteworthy for their general combining ability.

Observations were also made on the phenotypic stability of the hybrids in respect of various characters such as earliness and fibre strength.

508 Brown, J. J., Howell, N. A., Fiori, L. A., Sands, J. E. & Little, H. W.
**Evaluation of the yarn properties of a high-strength interspecies cotton.**
Text. Res. J. 1957 : **27** : 332–39.

A high-strength cotton (Pressley index 11·5) from *Gossypium arboreum* x *G. thurberi* x *G. hirsutum*, back crossed five times to locally adapted *G. hirsutum* varieties grown at Statesville, NC, was compared with five control cottons with Pressley values varying between 7·6 and 10·5. The hybrid was $\frac{1}{32}$ to $\frac{13}{32}$ in. shorter in fibre length than the controls. It was found that yarns made from the hybrid cotton were as strong and as uniform as those made from the much longer and finer Karnak cotton and were much stronger and more uniform than those from the other cottons. A limited statistical analysis of yarn breaking-strength data indicated that fibre strength is more important to yarn strength than either fibre fineness or length.

509 Abdul Hameed Khan
**A new long staple variety of cotton for Multan Tract.**
Pakist. Cott. 1958 : **2** : No. 3 : p. 10.

Lasani–11, developed at Multan, is capable of spinning 65s to 70s; its staple length is $1\frac{1}{8}$–$1\frac{1}{16}$ in. and its ginning outturn is 32·7%. In yield and quality, Lasani–11 is superior to 124F, which is the principal variety of American cotton grown in this region. On account of its extreme hairiness, Lasani–11 is highly resistant to jassids. It is midseason in maturity.

510 Senn, E. & Lhuillier, J.
Compte rendu d'un voyage d'étude sur la production cotonnière de l'U.R.S.S. **(Report on a journey to study cotton production in the USSR).**
Cot. et Fibr. trop. 1957 : **12** : 289–316.

A brief mention is made of the work of the Institute of Genetics and Plant Physiology set up by the Academy of Sciences of Uzbekistan. Attention is focussed on vegetative hybridization which has been used to develop a productive new cotton, designated AN2. At Taškent, attempts are being made to breed a variety of *Gossypium barbadense* which matures rapidly and has a compact habit of growth. Interspecific and intergeneric hybridization is also

under way. The station at Fergana has produced the widely-grown Russian variety 108F and attempts are being made to breed an improved variety with less tendency to lodge and longer fibre.
Descriptions are provided of three varieties widely cultivated in the USSR and two new varieties are mentioned; these latter are early, resist wilt and have good technological properties.

511 Heine-Geldern, R.
**Some problems of migration in the Pacific.**
Kultur und Sprache. Wien. Beitr. Kulturgesch. Ling. 1952 : **9** : 313–62.
Drawing upon evidence from the literature, the author argues against the theory of the American origin of the Polynesians. A section on relevant cultivated plants includes a discussion of the introduction of *Gossypium tomentosum* and *G. hirsutum* var. *punctatum* from the New World into the eastern Pacific islands and of the subsequent history of these cottons in precolonial times.

512 Rebenfeld, L. & Virgin, W. P.
**Relation between the X-ray angle of cottons and their fiber mechanical properties.**
Text. Res. J. 1957 : **27** : 286–89.
In 16 cotton varieties, highly significant correlations were found between spiral angle on the one hand, as measured by the X-ray angle, and Pressley bundle strength at 0·0 mm. gauge, single fibre elastic modulus and single fibre breaking elongation on the other. The correlation with Pressley strength at 5 mm. gauge was not significant.

513 Lorenzo, J. R.
Indices tecnológicos de los algodones producidos comercialmente en la República Argentina. (**Technological indices for cottons produced commercially in the Argentine Republic**).
Rev. Fac. Agron. B. Aires 1957 : **14** : 108–40.
Data on fibre length, uniformity, resistance, fineness, maturity and waste, and on oil content, protein content and industrial yield of seed in various localities are given for the main varieties grown in Argentina. The longest fibre was found in Catamarca 321 (24·6 mm.), which also had the finest fibre and good seed characters, and in Deltapine 14 and 15 (24·2 mm.), which were among the best in uniformity and maturity; Catamarca 321 is suited to irrigated land and the Deltapine varieties to unirrigated areas. Juntalgodón Brebbia 914 and 341 had the strongest fibre and Mascías 017 showed least waste.

514 **Cotton varieties in mechanized test.**
What's New Crops Soils 1958 : **10** : No. 8 : p. 26.
A series of new cotton varieties were tested for adaptation to mechanized harvesting at the Delta Branch Experiment Station, Stoneville, Miss. The yield of cotton seed during the 3-year trial was highest for Delfos 9169; DES 1000 Smooth Leaf had the best harvested lint yield, this being 916 pounds per acre. Deltapine Staple and Delfos 9169 had superior staple lengths and DES 1000 Smooth Leaf had a lint percentage of 39·3. Delfos 9169 and Deltapine Staple had the highest average picking efficiencies but varietal differences in this respect were not significant. DES 1000 Smooth Leaf had an average grade of middling.

515 Wessling, W. H.
**Resistance to boll weevil in mixed populations of resistant and susceptible cotton plants.**
J. econ. Ent. 1958 : **51** : 502–06.
The resistant strain Pilose carrying the mutant gene $H_2$ was grown alone and in mixed populations with the susceptible variety All-In-One. Individual plots in the experiment were uniformly infested with boll weevils and the plots were isolated from each other by a barrier crop of maize. The proportion of squares with punctures made by the weevil during egg laying was taken as an inverse measure of the degree of resistance of the host plant. It was found that in all the populations Pilose showed significantly more resistance than the susceptible variety. As the number of susceptible plants in the population increased, a slight but significant increase in the number of egg-laying punctures on Pilose was noted.
It was assumed that when the number of resistant plants in the large population is very low, the effect of their resistance is hardly detectable, if this resistance is of a relatively low order. A moderate degree of insect resistance will evolve in a natural population when either the insect infestation is relatively low or the proportion of resistant mutants in the populations is fairly high. Breeders searching for a moderate degree of resistance in large populations need to study each individual plant otherwise they may overlook the few resistant ones.

516 Wessling, W. H.
**Genotypic reactions to boll weevil attack in Upland cotton.**
J. econ. Ent. 1958 : **51** : 508–12.

Strains of Upland cotton, each homozygous for one of the mutant genes $H_1$, $H_2$, *gl* or *R*, were crossed in all possible combinations at the North Carolina Agricultural Experiment Station. The $F_1$ hybrids were selfed and, from the $F_2$ progeny, plants homozygous for double mutant combinations such as $H_1$ $H_1$ $H_2$ $H_2$ or $H_2$ $H_2$ *gl gl* were selected. Sister plants homozygous for the opposite nonmutant alleles were also selected; these were used as controls to exclude possible effects of different genetic backgrounds in comparing the effects of main genes.

All the lines carrying mutant genes showed some resistance to attack by *Anthonomus grandis*. Lines carrying both $H_1$ and $H_2$ were most resistant and those with the combination *gl* $H_2$ were more resistant than lines carrying *gl* $H_1$. Lines carrying $R_1$ in combination with either *gl* or $H_2$ were tested in a second experiment and in both cases a considerable degree of resistance was found. The main effects of the mutant genes, $H_1$, $H_2$ and *gl* was estimated, assuming that interactions between genes were unimportant; it appeared that $H_2$ conferred more resistance than $H_1$ and that *gl* had no significant effect under these particular experimental conditions.

517 Brazzel, J. R. & Martin, D. F.
**Resistance of cotton to pink bollworm damage.**
Bull. Tex. agric. Exp. Sta. 1956 : No. 843 : Pp. 20.

At Texas Agricultural Experiment Station, 139 species and varieties of cotton were screened for resistance to pink bollworm in a greenhouse experiment. The cross Stoneville 2B x *Gossypium tomentosum* showed resistance; when the seeds were attacked, a large number of new cells were produced which engulfed and killed many larvae. This cell proliferation did not usually prevent the formation of normal lint and seed. *G. thurberi* is considered to have some antibiotic effect on pink bollworm larvae but not so much as Stoneville 2B x *G. tomentosum*; young fast-growing bolls reacted to insect injury by producing masses of granular tissue from the carpel walls, many larvae being killed apparently by mechanical pressure.

The locule attacked was usually destroyed and sometimes the entire boll. Hexaploid 2–64 exhibited a smaller degree of resistance, the mechanism of which was not determined.

In field plot experiments with a smaller number of cottons, a highly significant number of *G. thurberi* bolls escaped bollworm damage. Studies on oviposition of the pink bollworm moth showed that few eggs were laid on plants of *G. thurberi*, the physical characteristics of *G. thurberi* being unattractive to the ovipositing moths. It was found that a tight straight calyx and flared or deciduous bracts discouraged oviposition on the bolls. Prominent veins on the leaves and pubescence rendered the vegetative parts attractive for oviposition. It is suggested that the easiest way to produce a variety with resistance to pink bollworm would be to combine those characters encouraging the moth to oviposit on the vegetative parts. On such a plant, first instar larvae would have to migrate in search of food and so mortality from environmental factors would be increased, also eggs on the vegetative parts would be more accessible to natural parasites and predators and the larvae could be more easily controlled by insecticides.

518 Čanev, K.
**(Flax breeding).**
Naučn. Trud. (Sci. Trans.) Minist. Zemed., Sofija : Ser. Rastenievădstvo (Pl. - Industr.) 1957 : **2** : No. 6 : 15–28. [Bulgarian).

This account of flax breeding in Sofia mentions hybrids 95, 136 and 242 which have a 10–15% higher yield of stems than Plovdiv 25 and longer fibre of better quality. They were obtained by crossing Plovdiv 25 with such varieties as Herman Brandt, Prjadil'ščik [Weaver], Riga and 21–76. Plovdiv 25 had been previously selected for improved yield from a white-flowering variety originating from Germany.

519 **A disease-resistant flax.**
Agric. Res., Wash. 1958 : **7** : No. 11 : p. 16.

Adapted to the north-central region of the USA, Arny (Crystal x Redson) is resistant to rust and wilt, high in yielding capacity, and superior to some standard varieties in oil quality and equal in oil content. It is also an improvement as regards resistance to pasmo.

520 Marciotte, C. V.
Catalogación de variedades. **(Catalogue of varieties).**
Rev. Invest. agríc. B. Aires 1958 : **12** : 97–104.

The flax varieties Mapún MA, Pergamino Mapún 52 MAG, Achay MA, Calchaquí MAG, Pergamino Mocoví MAG and Ranquel MAG are

described and data given on their yields; all were released in Argentina between 1943 and 1953. Ranquel MAG is a dual-purpose variety.

521 Flor, H. H.
**Mutation to wider virulence in *Melampsora lini.***
Phytopathology 1958 : **48** : 297–301.

By means of 24 flax varieties, X-irradiated uredospores of race 22 x race 1 of *M. lini* were screened for mutation from dominant avirulence to recessive virulence [cf. XXIV, 1273]. A preliminary report on the pathogenicity of some of the mutants has already appeared [XXVII, 3233]. With two exceptions, each mutant fell into one of six patterns of pathogenicity, differing from the control $F_1$ culture in virulence on a single differential variety or a group of differentials. The two exceptional mutants had a wider range of pathogenicity and are considered to represent different double mutations. Of the eight mutant races thus obtained, seven had not been previously encountered. The groups of varieties on which pathogenicity appeared to be conditioned by a single mutation were the same as those on which pathogenicity was found to be linked in earlier investigations on hybridization. Two mutant races were identified in a test for spontaneous mutation in an $F_1$ uredospore culture of race 22 x race 1. The naturally-mutating genes were the same as those which mutated most frequently in response to X irradiation.

522 Klug, R. J.
**Physiological studies of mutants of *Colletotrichum linicolum* induced by radiation.**
Diss. Abstr. 1958 : **18** : Publ. No. 23,938 : p. 35. (Abst.)

Mutants induced by α radiation showed a range in pathogenicity on the flax Punjab, from one mutant which was more pathogenic than the parent, through intermediate types, to avirulent mutants. The mutants differed from the parent in plus and minus directions in two or more physiological characters. As reported elsewhere, some mutants were distinguished by tolerance of increased osmotic pressures [cf. XXVII, 3236]. No correlations were detected between physiological characters and pathogenicity.

523 Matveev, N. D.
**(How the variety Svetoč was bred).**
Lën i Konoplja (Flax & Hemp) 1958 : No. 1 : 23–26. [Russian].

The breeding history of the flax Svetoč [Torch], which was made a standard in the 'thirties, is described. Mention is made of I7 and I9, more recent varieties bred at the Flax Institute. I7 is resistant to *Fusarium* and I9 to lodging.

524 Köhler, D.
Zur Vererbung der Monözie beim Hanf.
**(On the inheritance of monecism in hemp).**
Z. VererbLehre 1958 : **89** : 437–47.

Crosses involving diecious and monecious hemps studied at the Technical High School of Braunschweig showed that two nonallelic and nonlinked factors designated *A* and *B* are involved in the inheritance of monecism. These two genes are inherited independently from the *X* and *Y* genes controlling the sexual characters of diecious hemp; the genes *A* and *B* have no effect on males, which have the genotype *XY* but they have an additive effect on forms with the *XX* genotype. All these latter have the female growth habit but show differing tendencies in the production of male flowers; for example this tendency is greater in forms with the genotype *aaBb* than in those with *AABb*.

525 Pate, J. B. & Joyner, J. F.
**The inheritance of a male sterility factor in kenaf, *Hibiscus cannabinus* L.**
Agron. J. 1958 : **50** : 402–03.

A type of male sterility discovered in the variety Salvadorian depended on a single recessive gene.

526 Sy [Ssu], C.-M. & Lo, Y.-W.
**[Studies on the control of kenaf anthracnose (*Colletotrichum hibisci* Pollacci)].**
Chih-wu Ping-li-hsueh Pao (J. Pl. Path.)/ Acta phytopath. sin. 1958 : **4** : 25–55. [Chinese].

Strains resistant to the above pathogen and capable of ripening seed in northern China have been selected from the variety Madras Red.

527 Pate, J. B., Summers, T. E. & Menzel, M. Y.
**Resistance of *Hibiscus eetveldianus* to root-knot nematodes and the possibilities of its use as a source of resistance in kenaf, *Hibiscus cannabinus* L.**
Plant Dis. Reptr. 1958 : **42** : 796–97.

$C_3$ amphidiploids obtained by treating the sterile $F_1$ of *H. cannabinus* x *H. eetveldianus* have approached the latter species in resistance to root-knot nematodes (*Meloidogyne incognita*

and *M. incognita* var. *acrita*) in field tests in southern Florida. The amphidiploids are however unsatisfactory for fibre and show very little segregation for plant type. Attempts at back crossing to kenaf have so far failed. The $2n$ numbers of kenaf, *H. eetveldianus*, the $F_1$ between the two species and the $C_3$ of the amphidiploid are respectively 36, 72, 54 and *ca.* 108. The genome relationships between the two species are under investigation with a view to deciding upon the best procedure for breeding a fertile line combining nematode resistance and acceptable plant type.

528 Okura, E. & Kono, M.
**Cytogenetical studies of *Edgeworthia papyrifera* Sieb. et Zucc. I. Karyotype analysis of two varieties, *Kochi* and *Shizuoka*.**
Biol. J. Okayama Univ. 1958 : **4** : 60–66.
No significant differences were found in chromosome morphology between the two varieties studied and the following caryotype formula is suggested: $k\ (2n) = 36 = 2A^{sm} + 2B^{sm} + 2C^{sm} + 4D^{sm} + 2E^{sm} + 6F^{sm} + 2G^{sm} + 2_{cs}H^{sm} + 6I^{sm} + 2J^{sm} + 2K^{sm} + 2_{cs}L^{sm} + 2M^{sm}$.

529 Nakahira, K. & Etoo [Eto], T.
**(Studies on breeding trees for special purposes. V. On the yield, fibre and paper quality of artificial 6-ploid *Edgeworthia papyrifera*).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 157–60. [Japanese].
The promising characteristics of the hexaploid strain of the Shizuoka race have been already indicated [XXVIII, 3226]. In the present paper, it is shown that the hexaploid strain is superior to the diploid in bark yield, fibre content, length and diameter of fibres and paper strength. It is superior, with regard to paper strength, even to the high-quality Kochi race.

## SUGAR AND STARCH PLANTS

530 Dunkelman, P. H., Grassel, C. O. & Belcher, B. A.
**Sugarcane breeding at Canal Point Florida, during 1957.**
Sug. Bull., N. Orleans 1958 : **36** : 240–50.
A large number of crosses was made during the year, involving as many as possible of the élite lines in various combinations and also including many desirable recent selections. Details of the crossings carried out are presented in table form.

531 Ortega, D. A. & Torrellas G., A.
Cruzamientos de caña de azúcar en el Centro de Investigaciones Agronómicas.
**(Crosses of sugar cane at the Centre of Agronomic Investigations).**
Agron. trop., Venezuela 1957 : **7** : 69–81.
After an account of the breeding aims, the chief parental varieties used and the crossing procedure and testing methods employed at the above station at Maracay, Venezuela, a list of selections undergoing trial is presented, together with details of their parentage.

532 Tapay, J. T.
**Performance tests of some selected hybrid sugarcanes at La Granja Experiment Station.**
Philipp. Sug. Inst. Quart. 1958 : **6** : 15–30.
All the eight hybrid selections tested at the above station in the Philippines were more resistant to Fiji disease than the standard variety Alunan, Phil 48–21 (Barbados 10/12 x POJ2883) and Phil 48–15 as both plant and ratoon canes. Phil 49–22 and Phil 49–4, both from Trojan x Alunan, exhibited the fastest growth and gave the highest yields of sugar.

533 **Distribution of varieties N : Co. 334 and N : Co. 382.**
S. Afr. Sug. J. 1958 : **42** : p. 493.
Both N:Co.382 (POJ2725 x Co.301) and N:CO.334 (Co.421 x Co.312) will probably show their greatest value when grown on the coastal sands of Natal. The latter variety will probably also do well in the damper areas of the cane belt. In sucrose content, N:Co.382 resembles Co.301 while N:Co.334 is below N:Co.310 but usually superior to Co.301. Both varieties are fairly resistant to smut and highly resistant to red rot and streak. N:Co.382 is also resistant to mosaic; N:Co.334 is neither particularly susceptible nor resistant. The latter cane is generally highly intolerant of ratoon stunting disease and may be difficult to handle on accouut of spines on the leaf sheaths.

534 Parthasarathi, K. & Vijayasaradhy, M.
**On the phenolic content of sugarcane and spontaneum juices.**
Curr. Sci. 1958 : **27** : 218–19.
Six Co. canes and six varieties of *Saccharum spontaneum* were analysed for content of phenols expressed as phloroglucinol. Of the former canes, Co.285 had the highest content (102 mg. per 100 g. of juice). The value for the remaining Co. canes ranged from 58 to 28 mg. The phenols content of the *S. spontaneum* canes varied from

139 to 70 mg., with the exception of SES532 which contained only 45 mg. It is suggested that high content of phenols may be of significance in determining hardiness and disease resistance.

535 Coleman, R. E.
**Factors affecting the flowering of sugarcane.**
Plant Physiol. 1958 : **33** : Suppl. p. xx. (Abst.)

The effects of various treatments upon flowering in canes normally remaining vegetative were investigated at Houma, La., as a preliminary to controlled breeding. Flowering was induced in two varieties by a photoperiod of 12 hr. and 25 min. When one variety was subjected to noninductive day-lengths from 15 July to 1 September, it flowered as the result of treatment with inductive day-lengths after 1 September. Foliar sprays with growth regulators, anti-auxins and organic acids or shade treatment during the later part of the day failed to bring about flowering.

536 Yusuf, N. D.
**The control of arrowing and fuzz production in sugar cane.**
Int. Sug. J. 1958 : **60** : 219–21.

A combination of heavy watering and long day treatment induced flowering in 15 out of 21 varieties grown at Lyallpur, West Pakistan, in 1954/55, and viable seed was obtained from 11 varieties. The effect of altitude has also been investigated and it has been found that the flowering season is much prolonged, from two or three weeks to about six months. The bearing of these observations on breeding and seed production is mentioned.

537 Štyrlov, A.
**(Sorgo, a highly rewarding crop).**
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.), 1958 : No. 6 : 56–57. [Russian].

Kitajskij Jantar' 813 [Chinese Amber 813] was the most productive of green and dry matter among the sugar sorghums tested in the Čečeno-Inguš ASSR. Two promising forms of Kitajskij Jantar' 813 x Oranževoe 450 [Orange 450] were selected. One form is over 5 m. tall but is only suitable for cultivation under irrigation; the other has a high grain yield per panicle and is drought resistant.

538 **New high-sugar sorgo.**
Agric. Res., Wash. 1958 : **6** : No. 12 : p. 16.

The sweet sorghum Brawley (Rex x Collier) has been released for growing under irrigated conditions in the Imperial Valley of California and in similar areas in the western states. Its early maturity makes possible the production of two crops a year in the Imperial Valley. Ranking high in sucrose content and juice purity, the variety compares favourably with other commercial sugar sorghums, such as Rex and Tracy, in resistance to lodging.

La sperimentazione bieticola dell'anno 1955. **(Beet tests in 1955).**
Consorzio sacc. Ital., Genova : Pp. 59.

539 *Bonciarelli, F. Confronto fra diverse varietà di barbabietola nella pianura di Foligno. (Comparison of different beet varieties in the Foligno plain). (pp. 24–28).*

Trials of 12 varieties showed that the highest yields of sugar were given usually by varieties such as Desprez TM and Mezzano P, with high root yields, rather than those with high sugar contents such as Buszczynski MLR and Cesena P. One of the best in yield of sugar in the period 1953–55 was Maribo P; the results showed no clear distinction in yield between Klein E and Klein Polybeta. [Cf. XXVIII, 1983].

540 *Aldrovandi, A., Antonelli, C., Giardini, A. & Girotto, G. Bieticoltura meridionale in Maremma. (Southern beet-growing in the Maremma). (pp. 29–44).*

Comparisons of a number of sugar-beet strains obtained from different countries showed that the best yields in autumn sowings in southern Italy were given by polyploid varieties. Diploid varieties from Germany, Italy, Great Britain and the USA were roughly equal in yield; the least amount of bolting was in the Italian variety Cesena NSA, which in October sowings had 4% compared with 19% in Klein AA and 36% in Klein Polybeta.

Relazione del sesto anno di attività del Comitato Tecnico Permanente della A.N.B. **(Report of the sixth year of activity of the Permanent Technical Committee of the National Association of Beet Growers).**
Bologna 1957 : Pp. 262.

541 *Gallarate, G. Indagini su varietà di barbabietole da zucchero svolte nel 1956. (Investigations on sugar-beet varieties carried out in 1956). (pp. 38–111).*

The results of tests of 15 commercial varieties commonly grown in Italy, carried out in 15 different places, are reported. In almost all localities the Z and N types, including the

Italian Cesena varieties, gave a lower yield of sugar per unit area than the E types and the polyploids. The best varieties in one zone were generally the best in others, there being little evidence of regional adaptation; the highest yields in almost all cases were given by the polyploid varieties Hilleshög, Maribo P and Klein Polybeta.
A number of less common varieties were also tested; only some recent polyploids, such as Polyrave, Mezzano P, Saros P and Dippes Rekord, showed any marked superiority to the varieties already grown in respect of sugar yield per unit area.
Observations on 15 varieties exposed to *Cercospora* showed that under conditions of severe attack even those classed as resistant were very little better than the susceptible standards in total yield of sugar and some were even inferior. The highest sugar yields were again given by the polyploid varieties.

542 *Gallarate, G. Semina autunnale della barbabietola da zucchero.* (*Autumn sowing of sugar beet*). (*pp. 112–54*).

A report is given of experiments carried out to test the possibilities of planting sugar beet in the autumn in southern Italy and in Sicily. Preliminary tests showed US15 to be inferior to Cesena NSA and Klein AA in vigour in the early stages in some localities; in all localities and all three sowing times this variety had the highest percentage of bolters, in which respect Cesena NSA was the best. The highest root yield and hence the best yield of sugar was given by Klein AA.
In observations on a collection of 11 varieties, US15 again showed the highest degree of bolting. Among the autumn varieties Cesena NSA and Klein AA had the least, and in the spring varieties Hilleshög polyploid and Klein Polybeta had lower percentages of bolting than Cesena P. The highest yields of sugar were given by E6044, Klein AA and Hilleshög and the conclusion is reached that yielding capacity is a more important factor in choosing a variety for autumn sowing than resistance to bolting.

543 Hosokawa, S. & Takeda, T.
**(Studies on hybrid vigour in sugar beet. I. On $F_1$ intervarietal hybrids of sugar beet).**
Hokkaido Nogyo Shikenjo Hokoku/Rep. Hokkaido agric. Exp. Sta. 1957 : No. 73 : 1–8. [Japanese].

Two sets of experiments are described. In the first data are provided on the relative performance of a series of varieties (mainly Honiku strains) and their diallel $F_1$ hybrids in respect of root weight, sugar percentage, leaf production and height. In the second, intergroup crossings between Honiku strains of the Vilmorin and Kleinwanzleben types were effected and comparisons made between the parents and $F_1$ hybrids in respect of root weight, sugar percentage and yield of sugar per unit area. In general, $F_1$ hybrids were superior to both parents. Positive correlations were found to exist between parental mean and hybrid value in respect of root yield, sugar content and yield of sugar per unit area.

544 Powers, L., Finkner, R. E., Doxtator, C. W. & Swink, J. F.
**Preliminary studies on reciprocal recurrent selection in sugar beets.**
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 596–610.

Some preliminary studies on the application of the method of reciprocal recurrent selection [cf. XX, 263] to sugar beet are reported. The material studied comprised 600 selected roots of the variety American Crystal 35. These were divided into two groups according to hypocotyl colour: green (*rr*) or red (*RR* and *Rr*). Each root was divided into four quarters. Two quarters of each were planted in isolation plots, one for each group, to obtain selfed seed. The other two were planted in a mixed plot in which beet of the two groups alternated, to obtain an estimate of cross fertilization between the two groups. Another type of mixed plot in which the plants with green and red hypocotyls were in a ratio of 2 : 1 respectively is also described. The genotypes of mother plants whose progeny are being tested can be conserved by selfing or vegetative propagation. Probabilities for progenies exceeding the average of the two checks are given for eight of the mother beets.

545 Sedlmayr, K.
A poliploidia szerepe a növénynemesítésben. **(The role of polyploidy in plant breeding).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1956 : **9** : 177–93.

Results of Hungarian yield trials with diploid, triploid and tetraploid sugar beets in 1954 are described. The triploid Beta 1, the newly registered diploid hybrid Beta K–91 and other varieties are promising. Polyploidy was induced

by colchicine treatment and the resulting tetraploids then crossed with diploids.

546 Donà dalle Rose, A.
Valore teorico e pratico dei tipi di barbabietola migliorati sulla base della poliploidia indotta con riferimento ad un sessennio di coltura in Italia. (**Theoretical and practical value of beet types bred on the basis of induced polyploidy with reference to six years of cultivation in Italy**).
Agricoltura d. Venezie 1958 : **12** : 419–29.

Italian experience has confirmed the superiority of the triploids in sugar content, yield and purity of juice, though they have a slightly higher content of pith. They are less prone to bolting than the diploids and, having a lower transpiration rate, are more resistant to drought; their mean number of seeds per inflorescence is 1·6, compared with 2·5 in the diploids and 1·4 in the tetraploids. Results of trials in different parts of Italy during the last six years have shown the commercial polyploid beets to be more regular in yield, particularly in the south, and in general more tolerant of *Cercospora*. Their greater freedom from bolting has made them especially suitable for autumn sowing in southern Italy; in this respect tetraploid forms are superior to triploids.

547 Oldemeyer, R. K.
**Bolting resistance.**
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : p. 635.

Based on work at the Great Western Sugar Co., USA, the following note is given. "Inbred lines vernalized until some bolters began to appear, then forced, revealed clear-cut differences between lines as to bolting resistance. This technique would perhaps be more efficient than field selection."

548 Krouch, E. D., Kintzley, J. P. & Taylor, R. D.
**Apparatus used to control pollination of sugar beets.**
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 633–34.

A dual-purpose apparatus used in sugar-beet breeding at Fort Collins, Colo., for the collection and application of pollen is described. A small vacuum cleaner, a galvanized steel tubular part with an air vent, a deflector, rubber and glass tubing, a bottle serving both as collector and distributor, and a rubber bulb enter into its construction.

549 Artschwager, E. & Brewbaker, H. E.
**Correlation studies of chemical and morphological characters of sugar beet variety GW 413.**
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 576–82.

With a view to facilitating selection, a study was made of relationships between internal morphological characters of the root and chemical properties in the above variety, which is known to be genetically heterogeneous. Ring density was correlated with sucrose percentage and purity with an $r$ value of + 0·22 and + 0·20 respectively, significant at the 5% level. These values are not however regarded as sufficiently high to encourage use of ring density as a short cut in selecting for the two characters. Probably the chief value of internal morphological characters lies in their use as a means of identifying uniform strains.

550 Savitsky, V. F.
Genetische Studien und Züchtungsmethoden bei monogermen Rüben. (**Genetical studies and breeding methods with monogerm beets**).
Z. Pflanzenz. 1958 : **40** : 1–36.

For the benefit of German workers, a full account in German is presented of the author's work on monogerm sugar beet. Accounts of the work described have already been summarized in *Plant Breeding Abstracts*.

551 Gačinskij, E.
(**Sugar beet**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.). 1958 : No. 6 : 73–76. [Russian].

An outline of the evolutionary history of *Beta vulgaris* and the history of sugar-beet cultivation in Russia is given. A few high-yielding varieties bred at Ramon' and the monogerm varieties from Belaja Cerkov' and Jaltuškov are referred to briefly. These monogerm beets yield more sugar per unit area than ordinary varieties.

552 Bubnovskij, N. D.
(**The achievements of beet growers in Soviet Ukraine**).
Sahar. Svekla (Sug. Beet) 1958 : No. 2 : 5–9. [Russian].

Mention is made of sugar beet varieties highly productive of roots and sugar which have been bred at various Ukrainian institutes. They include monogerm beets from Belaja Cerkov'

and Jaltuškov, said to equal ordinary varieties in quality and yield.

553 Rapport van de Commissie ter bevordering der Suikerbietenteelt in de Noordelijke Provinciën over 1957. **(Report for 1957 of the Committee for the Advancement of Sugar Beet Cultivation in the Northern Provinces).** Meded. Inst. rationele SuikProd. 1958 : **28** : 57–148.

The work described included trials of four varieties in the Netherlands, in which sowing on 26 March resulted in higher yields of leaves, roots and sugar than sowing on 8 April. Zwaanesse III and the polyploids Polybeta and Maribo P showed less tendency than other varieties to bolt after early sowing. Polybeta gave the highest sugar yield, Zwaanesse III and KWE the highest root yields.

554 Grinčenko, I. F.
**(The response of the sugar-beet varieties R06 and V020 to increased planting space).**
Sahar. Promyšl. (Sug. Industr.) 1958 : No. 4 : 59–60. [Russian].

R06 is early, drought resistant and has a high sugar content. It had higher root and sugar yields than the N standard variety V020 in trials at Ljubaševka, especially when the space was increased to 44·5 x 44·5 cm., with 1 or 2 plants per planting area, as against the customary spacing of 44·5 x 18 cm.

555 Oldemeyer, R. K.
**Factors affecting cold resistance.**
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : p. 632.

Notes are given on some results of seedling tests for cold resistance at the experimental station of the Great Western Sugar Co., USA. In a test in which two hardening treatments (3 and 7 days) were applied and in which seedlings at six different ages were frozen at — 8° C. for 1 and 1½ hr., the seedlings became progressively more susceptible to cold with age and showed more resistance with longer hardening and more killing with longer freezing. Data on the reactions of inbreds suggested however that stage of development may be a more important factor than age, the weaker and slower-growing inbreds being more resistant than larger inbreds of the same age. Two inbreds, one observed to be frost susceptible and the other resistant in the field at the mature stage, were equally susceptible as seedlings.

556 Mordašev, G. S.
**(The organization of beet-seed production in the Krasnodar territory).**
Sahar. Promyšl. (Sug. Industr.) 1958 : No. 4 : 57–59. [Russian].

Sugar-beet varieties recommended for cultivation in the above region are briefly described. R06 from Ramon' is an N type resistant to drought. P028 and Pervomajskij Gibrid [Pervomajsk Hybrid] are resistant to *Cercospora* and in some years yield more sugar per unit area than R06. BC Odnosemjannaja [BC Monogerm] from Belaja Cerkov' is labour-saving though less productive than the above polygerm varieties.

557 Popova, I. V.
**(The efficacy of selecting sugar beet for resistance to storage rot).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 128–30. [Russian].

Varieties 50–253, 4356, 50256 and 50258 proved resistant to *Botrytis* and other microorganisms responsible for rotting of roots in clamps at Ramon'. The results of preliminary tests, which consisted of placing sections of the roots into a pure culture of *B. cinerea* under controlled conditions, were confirmed by storing whole roots in clamps for a period of over 2 months.

558 Cizin, S. G.
**(The raw resources for the sugar factories in the Krasnodar territory).**
Sahar. Promyšl. (Sug. Industr.) 1958 : No. 4 : 12–15. [Russian].

Mention is made of P028 and Pervomajskij Gibrid [Pervomajsk Hybrid], both originating from the Pervomajsk Breeding Station. They are resistant to *Cercospora* and have a higher sugar content than the Ramon' tonnage varieties R02 and R632E.

559 Sapin, P.
Sélection du manioc à Yangambi.
**(Breeding of cassava at Yangambi).**
Bull. INÉAC 1958 : **7** : 181–95.

Agronomic and technological criteria used in selecting plants of cassava at Yangambi are listed and the testing procedure by which élite clones are chosen is outlined. Information is provided in tabular form on the place of origin, yield and agronomic and morphological characters of 11 élite clones selected at Yangambi.

560 Chant, S. R. & Marden, J. A.
**A method for the rapid propagation of cassava cuttings.**
Trop. Agriculture, Trin. 1958 : **35** : 195–99.

The method described should be of value to

cassava breeders wishing to obtain rapid multiplication of new hybrids for field trials. The young green shoots are excised from the parent cutting, their removal stimulating the development of buds in the axils of the nodes of the parent cutting. At least a three-fold multiplication of plants may be secured from each parent cutting. Treatment with α-naphthaleneacetic acid or indolylbutyric acid, or a mixture of the hormones, promoted root development but a concentration of only about 10 p.p.m. should be used.

561 RAGHAVAN, R. S.
**A chromosome survey of Indian Dioscoreas.**
Proc. Indian Acad. Sci. : Sect. B. : 1958 : **48** : 59–63.

The following 2*n* numbers are reported: *D. deltoidea*, *D. hispida*, *D. pubera* and *D. oppositifolia*, 40; *D. pentaphylla*, 40, 80; *D. alata*, 40, 60, 80; *D. bulbifera*, 40, 80, *ca.* 98–100; *D. belophylla*, 80; and *D. esculenta*, 90, 100, *ca.* 100.

## STIMULANTS

562 Les tabacs canadiens. **(The Canadian tobaccos).**
Rev. int. Tabacs 1958 : **33** : 89–90.

This is an extract from a report which has been summarized from another source [cf. XXVIII, 2667].

563 WITTMER, G.
Ricerche sugli effetti della radiazione in *Nicotiana*. III. Comportamento del carattere "lunghezza della foglia" in piante di *N. tabacum* di 1ª generazione da radiazione neutronica. **(Researches on the effects of radiation in *Nicotiana* III. Behaviour of the character leaf length in tobacco plants of the first generation from seed irradiated with neutrons).**
Tabacco, Roma 1958 : **62** : No. 686 : 46–52.

Plants of four cultivars originating from seed treated with thermal neutrons showed greater variation in leaf length than the controls. There was also a significant interaction between cultivar and dose. The individuals with the lowest leaf length were also the shortest.

564 VASIL'EV, A. F.
**(The latest in the regional standardisation of tobacco).**
Tabak (Tobacco) 1958 : No. 2 : 15–17. [Russian].

Kuban' 3, Trebizond KV2736 and Dubek Kirgizskij 03–4–15 [Kirgiz Dubec 03–4–15] are new standard varieties, the first for the Krasnodar territory and the other two for irrigated culture in Tajikistan. Kuban' 3 is resistant to *Thielaviopsis* and surpasses Trebizond 93 in quality and yield. Dubek Kirgizskij 03–4–15 is resistant to *Erysiphe*, outyields Ostrokonec 45/1906 [Pointed End 45/1906] and has better quality leaf. Trebizond KV2736 is more productive than Djumar 2386.

565 VASIL'EV, A. F.
**(The latest in the regional standardisation of *Nicotiana rustica* varieties).**
Tabak (Tobacco) 1958 : No. 3 : 51–52. [Russian].

Durman 956 was selected from Durman Mestnyj [Local Durman] at the Drjazginskaja Branch of the Tobacco Institute. It has been made a standard in the Krasnojarsk territory and the province of Akmolinsk, where it outyields the previous standard-variety AS18/7. It also shows improved resistance to bacterial leaf spot and scorching. Pehlec 39/34 supersedes AS 18/7 as a standard in the Altaj territory and the province of Gor'kij, and Lohis replaces Vysokoroslyj Zelenyj 317 [Tall Green 317] in the Vladimir province. The new standards are more productive and Lohis has better smoking properties than its predecessor.

566 SCARASCIA, G. T.
Osservazioni preliminari sugli effetti morfologici, genetici e citogenetici dell' irradiazione di semi di *Nicotiana tabacum* L. con neutroni termici. **(Preliminary observations on the morphological, genetic and cytogenetic effects of irradiation of seeds of *N. tabacum* L. with thermal neutrons).**
Tabacco, Roma 1958 : **62** : No. 686 : 3–16.

Resting seeds of a line of Virginia Bright that has been selected for five years were irradiated with doses of $1{\cdot}08 \times 10^{13}$, $3{\cdot}6 \times 10^{13}$ and $10{\cdot}8 \times 10^{13}$ neutrons/cm$^2$., the last of which proved lethal. Various morphological anomalies observed in the seedlings are described. Almost 50% of the plants from the second dosage were reduced in fertility and 5% of them were completely sterile. Chromosome breakage, ring formation and other cytological aberrations were observed during pollen meiosis.

The frequency of mutant types in the second generation from dosage 1 was over 3 times greater than in the control and in the progeny of dosage 2 was 35 times greater. The mutations were mostly teratological in nature.

567 Lukpanov, Ž.
**(Biochemical properties of hybrid tobacco forms).**
Tabak (Tobacco) 1958 : No. 2 : 17–18. [Russian].
Hybrid Trebizond (Trebizond KV x Trebizond 161), with a yield of 32 c. leaf per ha., is referred to as the most productive hybrid among those bred at the Alma-Ata Tobacco State Farm. Differences in the physiological and biochemical properties of the hybrid and its parents are noted. The high yield of the hybrid is attributed to greater height of the plant, increased number of leaves per plant, larger leaves and a higher rate of synthesis of dry matter. Data on carbohydrates, cellulose and protein ratios are also presented.

568 Clayton, E. E.
**The genetics and breeding progress in tobacco during the last 50 years.**
Agron. J. 1958 : **50** : 352–56.
The full text is given of a survey presented at the fiftieth anniversary meeting of the American Society of Agronomy in 1957 and dealing chiefly with the role of intraspecific and interspecific hybridization in breeding disease-resistant tobacco in the USA [cf. XXVIII, 1350].

569 Cameron, D. R.
**Mosaic tolerance in *Nicotiana tabacum*.**
Amer. J. Bot. 1958 : **45** : 564–66.
A study of the mosaic tolerance of *N. tabacum* 'Ambalema', when introduced into Red Russian, is reported. The Ambalema type of tolerance is known to depend on duplicate recessive genes, $mt_1$ and $mt_2$. The amount of virus in Red Russian ($mt_1$ $mt_2$) was much less than in susceptible Red Russian but considerably greater than in the tolerant Colombian type. By means of monosomic analysis it was established that $mt_2$ is situated in chromosome R. In view of the failure to locate $mt_1$, the question of the validity of the standard set of monosomics in tobacco is raised.

570 Bawden, F. C.
**Reversible changes in strains of tobacco mosaic virus from leguminous plants.**
J. gen. Microbiol. 1958 : **18** : 751–66.
Reversible changes shown by strains of the above virus in serological behaviour, aminoacid constitution, electrophoretic pattern, resistance to inactivation by ultraviolet radiation and type of local lesion produced in *Nicotiana glutinosa*, according to the host in which they were propagated, are ascribed to the selection of variants which originate in the host.

571 Nakayama, A. & Harada, S.
**(Studies on the rooting capacity of cuttings of tea-plant varieties. III. Cutting size, starch content and rooting capacity).**
Chagyo Gijutsu Kenkyu/Stud. Tea 1958 : No. 18 : 10–12. [Japanese].
Twenty-one varieties were investigated. Data are provided on starch content and the root weight, maximum root length and root number of the cuttings. The only significant correlation noted was between cutting weight and root weight. For cuttings of equal weight, starch content was correlated with root weight. [Cf. XXVII, 770–1].

572 Sylvain, P. G.
**Ethiopian coffee—its significance to world coffee problems.**
Econ. Bot. 1958 : **12** : 111–39.
In this review of coffee production in Ethiopia, attention is drawn to the significance of the country to breeders as the putative region of origin of *Coffea arabica*. Sections are included which survey (1) the Ethiopian types, (2) the programme of improvement of production in Ethiopia by various means, including selection, (3) research on Ethiopian types in countries in the Western and Eastern Hemispheres, and (4) the work being carried out on testing coffee for reaction to physiological races of leaf rust (*Hemileia vastatrix*) at the National Experiment Station, Sacavem, Portugal. Ethiopian types offer valuable germ plasm with respect to resistance to this disease and probably also such characters as resistance to other diseases, lower transpiration rate, more efficient root system and higher photosynthetic rate. The future of coffee breeding may lie in the development of varieties showing special physiological or anatomical characteristics which make them better adapted to specific areas, instead of attempting to produce types based only upon high yield records without knowledge of their dependence on ecological conditions.

573 Carvalho, A. & Antunes Filho, H.
Genética de *Coffea*. XXIII—Interação dos fatôres "sépalas desenvolvidas" e "*calycanthema*" em *Coffea arabica*.
**(Genetics of *coffea*. XXIII. Interaction of the developed sepals and *calycanthema* factors in *C. arabica*).**
Bragantia 1957 : **16** : xi–xiii.
The *calycanthema* mutant, characterized by large

petaloid calyces, is determined by a dominant factor designated *C*. The homozygote is unknown since the flowers of *Cc* plants drop off after pollination; the pollen is functional. The "developed calyces" of var. *goiaba* are foliaceous and persistent, being determined by the recessive gene *sd*, the heterozygotes have sepals intermediate between those of normal coffee and the homozygous *goiaba* mutant. The cross between *calycanthema* (*SdSdCc*) x *goiaba* (*sdsdcc*) gave *calycanthema* (*SdsdCc*) and intermediate *goiaba* plants (*Sdsdcc*) in a 1 : 1 ratio. On intercrossing the *SdsdCc* and *Sdsdcc* types, some *calycanthema* offspring were obtained which gave *calycanthema* and intermediate *goiaba* plants in a 1 : 1 ratio. It is therefore inferred that the *calycanthema* plants giving these two types of offspring were of genetic constitution *sdsdCc* and that *C* is epistatic to *sd*. [Cf. XXVII, 2096].

574 Antunes Filho, H. & Carvalho, A. Melhoramento do cafeeiro. XI—Análise da produção de progênies e híbridos de Bourbon Vermelho. **(Improvement of coffee. XI. Analysis of yield in progenies and hybrids of Bourbon Vermelho).** Bragantia 1957 : **16** : 175–95.

In order to test the possibility of eliminating the lowest-yielding trees on the basis of their yield up to the second year, investigations were made of 43 progenies of 25 trees of *Coffea arabica* var. *bourbon* 'Bourbon Vermelho' [Red Bourbon] which had been selfed and crossed in 1935. The yields calculated after 2, 4 and 6 years respectively corresponded fairly closely, so that of the 13 progenies in the lowest yield classes, i.e. below the mean after 2 years, all but 4 were in the lowest classes after 4 and all but 2 after 6 years. Of the 13 progenies in the highest yield classes after 2 years, 7 were in the top classes after 6 years. Yield figures for 10 progenies were available for the fourteenth year and in all but one case the progenies that were in the higher groups after the second year maintained their high position after 14 years. Of the 339 plants selected for best yield after 6 years, 89 would have been lost if the 13 poorest progenies had been discarded after the second year; this would have involved 89 plants, of which only 19 proved to have yields above the mean after 6 years and only 20 after 14 years. Of the two progenies with the best yields after 6 years, comprising 40 plants, 22 had yields above the mean after 14 years whereas in the two progenies with the lowest yield, comprising 40 plants, only 8 were above the mean after 14 years. Finally, of the 57 best plants after 6 years, 34 (58%) remained above the mean after 14 years and only 3 in the lowest class. The conclusion is therefore arrived at that no great harm would have been done in this group of progenies if selection had been performed at the end of six or even two years.

575 Antunes Filho, H. & Carvalho, A. Melhoramento do cafeeiro. XII—Variabilidade em linhas puras de café. **(Improvement of coffee. XII. Variability in pure lines of coffee).** Bragantia 1957 : **16** : 197–213.

The lines on which observations were made included two plants of *Coffea arabica* var. *bourbon* derived from haploids by duplication of the chromosome number and a hybrid between them. The hybrid showed less reduction in germinating capacity than the two pure lines but no increase in plant height, in which respect it was intermediate. The variation in all three lines was greater than in some selfed progenies of various lines of Bourbon, in which no signs of inbreeding depression were observed after several generations of inbreeding. The yield of the hybrid was somewhat greater than that of the two pure lines but the difference was not significant; the variation in yield was somewhat lower in the hybrid. The selfed lines showed a slight reduction in yield; the yield variations were greater and increased with the number of generations of selfing. The pure lines differed in the number of berries with only one seed and the hybrid was equal to or below the line with the least defective berries; in respect of the variation of this character the hybrid was intermediate. The proportion of berries with supernumerary seeds was lower in the pure lines and their hybrid than in the ordinary selfed lines; in respect of variation the hybrid was intermediate. Seed size was intermediate but less variable in the hybrid than in the pure lines. No case was observed in which the variation in the hybrid was greater than in the pure lines from which it arose.

576 Carvalho, A. *et al.* Melhoramento do cafeeiro. XIII—Café Bourbon Amarelo. **(Improvement of coffee. XIII. Amarelo Bourbon coffee).** Bragantia 1957 : **16** : 411–54.

Amarelo Bourbon [Yellow Bourbon] is a high yielding variety of uncertain origin. In 1945, 30 mother trees of this variety were selected from a plantation at Jaú, São Paulo. Branches

from these were grafted at Campinas and seedlings were obtained by open pollination. The performances of 20 seedlings from each mother plant were ascertained in trials at five centres: Campinas, Ribeirão Prêto, Pindoramo, Jaú and Mococa. Yield data for the first eight years of cropping are presented, also information on the incidence of peaberry and elephant seeds, quality rating, frequency of empty locules, and in the case of the Campinas trials, 1000-seed weight.

The mother trees with the highest yielding progenies were J30, J3, J8, J10, J11 and J24. It was noted that initial yield rankings were frequently different from the mean over the whole trial period. The latter value should therefore be used in selection.

The incidence of empty locules was low in all cases. The frequency of light red, heterozygous, fruits was 2·5%, indicating a relatively high frequency of cross pollination with red fruited homozygotes.

577 Schultes, R. E.
**A synopsis of the genus *Herrania*.**
J. Arnold Arbor. 1958 : **39** : 217–95.

The author presents a classification of the above genus, recognizing sect. *Herrania* and the new sect. *Subcymbicalyx*. *H. albiflora*, *H. purpurea* and *H. umbratica* comprise the first section. Fourteen species are described under sect. *Subcymbicalyx*. Historical notes on the genus, an account of the ecological preferences and local uses of various species and a list of common and vernacular names are included. The author emphasizes the potential importance of *Herrania* spp. as sources of germ plasm for the improvement of cacao.

578 Khan, A. H.
**Studies on growth and cultivation characteristics of medicinal and other economic plants under semi-temperate conditions.**
Pakist. J. For. 1957 : **7** : 319–69.

Brief descriptions of wild and cultivated varieties of *Papaver somniferum* are included in this account of medicinal plants and herbs grown in Pakistan.

579 Kleinschmidt, G. & Mothes, K.
Zur Züchtung eines Arzneimohns (*Papaver somniferum*). [**On breeding a medicinal poppy (*P. somniferum*)**].
Pharmazie 1958 : **13** : 357–60.

A high degree of dependence upon climatic conditions was found among poppies of varying origin tested for alkaloid content of the capsules over the period 1953–56 at Gatersleben, Germany, alkaloid content being lowest in poor summers.

By selection of some of the better lines, however, progenies which included a number of plants with high alkaloid content were obtained in 1957.

## MINOR CROP PLANTS

580 Sapko, D. D.
(**Hybrid *Chenopodium anthelminticum***).
Bot. Ž. (Bot. J), Moskva 1958 : **43** : 701–03. [Russian].

*Ch. anthelminticum* is a tetraploid, with $2n = 64$ as opposed to $2n = 32$ in *Ch. ambrosioides*. When the two are grown together spontaneous hybrids often occur. Artificial hybrids with $2n = 48$ have also been produced and are described. They display heterosis in height of plant and essential-oil content, yielding 26·3 kg. of oil per ha. as compared with 12·9 kg. from *Ch. ambrosioides* and 9·3 kg. from *Ch. anthelminticum*. Certain plants gave a higher proportion of hybrids when grown in proximity and these are being used for the production of hybrid seed. The heterosis does not persist in the $F_2$ and later generations.

The hybrids are sterile and are later in maturity than either of the parents.

581 Vernazza, N.
Ulje lavandulinih hibrida s otoka Hvara.
(**The oil of hybrid lavender from Hvar island**).
Arh. poljopr. Nauk. 1957 : **10** : No. 30 : 91–95.

The oil extracted from *Lavandula hybrida* plants grown in different districts of Hvar has been analysed and found to vary appreciably in quality. The best oil was obtained from a strain with dark blue flowers known locally as Plava [Blue]. It has a pleasant scent without a camphor taint and its linalyl acetate content, which determines oil quality, exceeds 18%.

582 Tamai, T., Tokumasu, S. & Shinohara, K.
(**Studies on breeding geranium for essential oil. I. The production of a polyploid strain of *Pelargonium roseum* and its characteristics**).
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 131–40. [Japanese].

The normal $2n$ strain of *P. roseum* is sterile. By colchicine treatment of the variety Bourbon, fertile $4n$ plants with increased oil content were

obtained. The 4*n* flowers have two kinds of anthers in varying proportions: (1) large pink anthers with functional pollen and (2) small yellow anthers with abortive pollen. Hybrids were not obtained by crossing the tetraploids with 2*n* *P. roseum* or *P. denticulatum.*

583 Kacen, D. G.
**(Local pepper varieties from the Moldavian SSR).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6. : 34–35. [Russian].

Gogošary Mestnyj [Local Gogošary], Plovdiv Mestnyj [Local Plovdiv] and Voskovoj Mestnyj [Waxy Local] are all high yielding disease resistant bush types of *Capsicum* pepper. They differ mainly with regard to maturity date and shape and colour of their fruit. Gogošary Mestnyj yields 188 c. per ha., the others 260 c. and 242 c. per ha. respectively.

584 Hirose, T., Ukita, S. & Takashima, S.
**(On species related to red pepper).**
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1957 : No. 9 : 13–22. [Japanese].

Full descriptions of botanical and economic characteristics are given of 13 introduced varieties pertaining to *Capsicum frutescens, C. pendulum, C. pubescens* or *C. microcarpon. C. frutescens* may be of value in breeding on account of its high pungency.

585 Hirose, T.
**(Studies on the pollination of red pepper. I. Flowering and the germinability of the pollen).**
Saikyo Daigaku Gakujutsu Hokoku, Nogaku/Sci. Rep. Saikyo Univ., Agric. 1957 : No. 9 : 5–12. [Japanese].

A series of Japanese and introduced varieties were studied. Varieties were found to differ in time of day at which anther dehiscence occurred. In general, pollen germination is at an optimum at 25–30° C. but varieties differed in the extent to which germination was inhibited at higher temperatures. The pollen of the variety Tabasco, in which pollen dehiscence is comparatively late (10–12 a.m.), germinates well at 35° C. and in appreciable amounts at 40° C.

586 Shinozaki, Y. & Ohara, S.
**(Observations on the characteristics of rape seed oil from the prefecture of Okayama).**
Okayama Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Okayama Univ. 1958 : No. 11 : 15–24. [Japanese].

Data are provided on the oil content, iodine value, sugar content, composition of the alcoholic extract and mustard-oil content of locally grown varieties. Attention is drawn to the variety Kinki 28 on account of its high yield, to Iseguro [Ise Black] for its low iodine value, and to an Ethiopian rape whose oil composition lies outside the range for ordinary rape.

587 Seshadri, C. R.
**Future of oilseeds research in India—III.—Castor.**
Indian Oilseeds J. 1958 : **2** : 109–11.

Studies of castor oil plant carried out in Hyderabad, Madras and Uttar Pradesh are mentioned and some improved strains are listed. It is considered that future work should be concentrated on developing types with an oil content of over 50%; other desirable characters which should be considered in breeding new strains are also mentioned.

588 Leszczakówna, B. & Malinowski, B.
Nowa odmiana rącznika o niewysypujących się nasionach ("Rącznik N 6").
**(A new variety of castor oil plant with nonshedding seeds, castor oil plant N6).**
Postępy Nauk Roln. 1956 : **3** No. 1 : 142–49.

This article deals with the history of breeding the new variety N6 with nonshattering fruits in the Poznań State Scientific Institute of Medicinal Plants, Poland. *Ricinus communis* ssp. *chinensis* served as initial material for selection. Crossing experiments showed that the nonshedding property of the seeds is inherited. The nonshedding capsule has valves which are thinner than usual and dry out simultaneously so that they do not split when ripe.

589 Srinivasalu, N. & Ramachandran, N.
**Occurrence of 'flowerless' castor plants.**
Madras agric. J. 1958 : **45** : 193–95.

In the $F_2$ of a cross between TMV2 and the South-African variety RC1077, flowerless plants appeared with a frequency of about 6%. The $F_2$ population was not large enough for the determination of the segregation ratio. The flowerless plants were very tall and had a high number of internodes.

590 Gursham Singh & Khem Singh Gill
**Promising new strains of sesamum for the Punjab.**
Indian Oilseeds J. 1958 : **2** : No. 3 : 6–9.

At the Oilseed Sub-Station, Mangwal, Punjab, three pure breeding and white seeded strains of *Sesamum* were obtained by single plant selection from local mixtures collected in the Nurpur

Sedhatha tract of the Kangra district. In tests at experimental stations, the three strains TS2A–43, TS12–34 and TS25–12 yielded respectively 12·5, 24·1 and 14·5% more than the local type. Only TS2A–43 and TS12–34 maintained their superiority in large-scale trials in cultivators' fields; on an average the increase in yield over that of the local variety was 25%. These two strains are profusely branching types whereas TS25–12 is a sparsely branching type.

591 Manner, R.
**Correlation studies between the parents and the progeny generations in oil flax.**
Hereditas, Lund 1958 : **44** : 37–64.

In further work on the parents and hybrids used in a previous investigation [XXVII, 2125], the characters studied were (1) plant height, (2) number of flowers per plant, (3) number of capsules per plant, (4) percentage of flowers not forming capsules, (5) number of seeds per plant, (6) seed weight per plant, (7) number of seeds per capsule, (8) seed weight per capsule and (9) mean seed weight. The correlation coefficients obtained on the one hand between the difference between the parents and, on the other, the difference between the $F_2$ and parental mean or the difference between the $F_2$ and parent with the higher value for a given character ($P_{max}$) were not close, only the coefficient for (4) between the parental difference and the difference between the $F_2$ and $P_{max}$ reaching significance ($r = +0{\cdot}5676$). The correlation coefficients between (*a*) the $P_{max}$ and the difference between the $F_2$ and parental mean or (*b*) the parental mean and the difference between the $F_2$ and $P_{max}$ were all negative, with the exception of the coefficient for (7) when calculated by method (*a*). They were significant when estimated by one or both of these methods, except in the case of (7) and (8). The correlation coefficients for the relationship between the parental difference and the difference between the $F_2$ and $F_4$ were not significant, with the exception of (4) for which a negative value ($r = -0{\cdot}2967$) with a low level of significance was obtained. Correlations between the performance of the parents, as measured by the mean or $P_{max}$, and the difference between the $F_2$ and $F_4$ were nonsignificant or reached only a low level of significance. The data indicated a marked relationship between the difference between the $F_2$ and $F_4$ on the one hand and the difference between the $F_2$ and parental mean on the other in the case of (2), (3), (5), (6) and (8). The correlations between the parental difference and $F_2$ or $F_4$ performance were in most cases positive but showed little or no significance, with the exception of the coefficient ($+0{\cdot}3837$) for (8) involving the $F_4$. Among the correlations between the difference between the $F_2$ and parental mean on the one hand and the $F_4$ on the other, only those for (6) and (7), respectively $-0{\cdot}4179$ and $+0{\cdot}5113$, reached a good level of significance. Coefficients for the difference $F_2$–$P_{max}$ and the $F_4$ value had little or no significance. Finally, correlations were estimated between (*a*) parental mean and the $F_2$, (*b*) parental mean and the $F_4$, (*c*) $P_{max}$ and the $F_2$ and (*d*) $P_{max}$ and the $F_4$. Characters showing significant relationships in all four calculations were (4), (8) and (9).

592 Mohácsi, T.
Az olajnemesítés kérdései. (**Questions of oil crop breeding**).
Agrártudomány 1958 : **10** : No. 4 : 23–25.

Improvement work with linseed is directed towards an increase in seed yield rather than oil content since the latter is difficult to attain.

593 Joglekar, R. G. & Deshmukh, N. Y.
**Cross 4-29—an improved strain of linseed for Vidarbha.**
Indian Oilseeds J. 1958 : **2** : No. 3 : 10–12.

N3, a high-yielding, early-ripening variety evolved at Nagpur, was crossed with IP135, a rust-resistant, late-ripening strain from the Indian Agricultural Research Institute, New Delhi. Segregation in the $F_2$ generation suggested monogenic inheritance of rust resistance. A single plant selection, Cross 4–29, was found to combine earliness, rust resistance, high oil content and high yield; in trials at Nagpur and Jabalpur, Cross 4–29 outyielded N3 and compared well with other improved strains. The seeds of Cross 4–29 are bolder than those of the local variety, the 1000-grain weight being 8·2 g. as compared with 5–7 g. for the local linseed. It ripens a week or ten days earlier than the local linseed.

594 Khem Singh Gill
**Powdery mildew — a new disease of linseed in Punjab.**
Indian Oilseeds J. 1958 : **2** : No. 3 : 16–17.

Of the 107 exotic varieties of linseed tested for their reaction to powdery mildew at Nagrota Bagwan, only one strain, LI5665 from the USA, was found to be resistant. This strain was also unattacked by rust and wilt. It is unsuitable for direct introduction on account of its late maturity but will be used as a source of mildew resistance in breeding new varieties.

595 Merh, J. L. & Kulkarni, S. N.
**Varietal resistance of linseed to wilt and rust I.**
Indian Oilseeds J. 1958 : **2** : No. 3 : 13–15.

Tabulated data are presented on the reaction to *Fusarium oxysporum* f. *lini* and *Melampsora lini* of linseed varieties collected from various states in India and tested at the Institute of Plant Industry, Indore, during the period 1953–55.

596 Merrill, S. (Jun.)
**Heterosis in tung.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 231–36.

In nursery and orchard experiments in Missouri and Louisiana, hybrids between inbred parents tended to surpass the parents having the higher values for growth measurements and fruit yield, although the proportion of statistically significant differences was small. The $F_1$ hybrids of La Crosse x Folsom and Lampton x Folsom showed the highest degree of heterosis. In crosses of Folsom and Lampton with G–46, heterosis was less evident.

597 Pinthus, M.
**(Varieties of sunflower for oil).**
Sadeh (Field)/Hassadeh 1958 : **38** : 962–64. [Hebrew].

Varietal trials of the Israeli variety Hazerah and introductions from various European countries and Canada are reported.

598 Kamal, M. A. M. & El-Damaty, A. H.
**Effect of fertilizer treatments and water levels on yield and composition of sunflower seed varieties.**
Ann. agric. Sci., Cairo 1597 : **2** : No. 1 : 137–51.

Three varieties of sunflower, Jirassol* Tall Russian, Jiranol* Sunrise and Jupiter Sun were tested for the effects of different fertilizer and irrigation treatments on yield, and nitrogen and oil contents. No significant differences due to different fertilizer treatments were observed. Increased irrigation improved yields and oil and nitrogen content. The highest yield and nitrogen and oil contents came from Jirassol.

599 Ljaščenko, I. F.
**[The question of vegetative hybridization in the sunflower (*Helianthus annuus*)].**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 710–12. [Russian].

Among several hundred grafts of albino sunflowers on normal green sunflowers, some became green whereas others, though developing well, remained without chlorophyll until just before flowering. Seeds from both types however gave only albino seedlings.

600 Wallace, R. H. & Habermann, H. M.
**Absence of seed dormancy in a white mutant strain of *Helianthus annuus* L.**
Plant Physiol. 1958 : **33** : 252–54.

Seeds of *H. annuus* homozygous for the white albino mutation showed a lack of dormancy, which seemed to be associated with the absence of carotenoid pigments in the resulting seedlings. Yellow mutants had the same dormancy requirements as green seeds. By storing seeds of selfed heterozygous green plants at 15° C., it is possible to prolong the dormancy of the normal seeds so that in plantings up to 7 weeks after harvesting, only white seedlings germinate. This provides a simple method of obtaining large numbers of the white mutants for experimental purposes.

601 Sharma, A. K. & Bhattacharyya, N. K.
**Structure and behaviour of chromosomes of species of *Acacia*.**
Phyton 1958 : **10** : 111–22.

The following $2n$ numbers are reported: *A. moniliformis*, *A. catechu* and *A. senegal*, 26; *A. farnesiana* and *A. leucophloea*, 52; and *A. arabica*, 44. Each species could be distinguished by its caryotype. Polyspory due to the continued division of the PMCs after meiosis II was noted in all the species. The basic chromosome number of the genus is probably 13. It is suggested that allopolyploidy in the case of the $2n = 52$ species and aneuploidy in such a species as *A. arabica* have played a role in the evolution of the genus. Structural changes in the chromosomes and reduction in the amount of chromatin are also regarded as probable evolutionary factors.

602 Sundara Raghavan, R. & Arora, C. M.
**Chromosome numbers in Indian medicinal plants—II.**
Proc. Indian Acad. Sci. : Sect. B : 1958 : **47** : 352–58.

A further paper gives the chromosome numbers of 31 species collected from southern India, Bombay and Uttar Pradesh [cf. XXVIII, 866]. The numbers ($2n$) of the following species are reported for the first time: *Clematis gouriana*, 16; *Naravelia zeylanica*, 16; *Polygonum glabrum*, 66; *Biophytum sensitivum*, 18; *Kedrostis rostrata*, 26; *Ceriops candolleana*, 36; *Sterculia urens*, 40;

* Jirasol = sunflower.

*Euphorbia hirta*, 20; *Phyllanthus urinaria*, 52; *Clausena willdenowii*, 36; *Caralluma attenuata*, 22; *Mussaenda luteola*, 22; *Avicennia alba*, *ca.* 66; *Cymbopogon iwarancusa*, 20; and *C. confertiflorus*, 60. In the case of the following five species, the $2n$ counts made by the authors differed from those reported by other investigators: *Nymphaea stellata* and *N. lotus*, 84; *Reinwardtia trigyna*, 22; *Pongamia pinnata*, 22; and *Cymbopogon martini*, 20.

603 NAKAYAMA, K.
**(Breeding cultivated medicinal plants).**
Seibutsukagaku/Biol. Sci. 1956 : **8** : 98–103. [Japanese].
Recent work on breeding improved strains of medicinal plants in Japan and elsewhere is reviewed. Among the topics considered are selection for higher content of active constituents and the effects of polyploidy.

604 MILOVIDOV, P. & ŠTORCHOVÁ, J.
Über die Chromosomenzahlen einiger Heilpflanzen. **(On the chromosome numbers of some medicinal plants).**
Öst. bot. Z. 1958 : **105** : 293–300.
The following chromosome numbers are reported: *Rauwolfia serpentina* $2n = 22$; *Cassia acutifolia* $2n = 28$; *Cnicus benedictus* $2n = 22$; *Thymus vulgaris* $2n = 30$ and *Fagopyrum esculentum* and *F. tataricum* $2n = 16$. Two satellite chromosomes were noticed in *R. serpentina* and one in both of the *Fagopyrum* species.

605 CHLÁDEK, M. & MESTENHAUSER, A.
***Chamomilla bohemica.***
Pharmazie 1958 : **13** : 297–99.
It is noted that a large-flowered colchicine-induced polyploid form has been produced at Brno, Czechoslovakia. It is similar to the normal form in drug content but gives a higher total yield.

606 FEINBRUN, N.
**Chromosome numbers and evolution in the genus *Colchicum*.**
Evolution, NY 1958 : **12** : 173–88.
The following $2n$ numbers are reported: *C. schimperi*, *C. ritchii*, *C. tuviae* and *C. guessfeldtianum*, 14; *C. hierosolymitanum*, 18; *C. steveni*, *C. hiemale*, *C. decaisnei* and *C. tunicatum*, 54. Basic numbers of $x = 7$ and $x = 9$ have thus been indicated. It is concluded that allopolyploidy, and secondary polyploidy involving addition or loss of single chromosome pairs, have played a major part in speciation within the genus.

607 VAN OS, F. H. L. & STEHOUWER, J. H.
Erfelijkheid van de samenstelling van het glycosidenmengsel bij *Digitalis purpurea*. **(Inheritance of the composition of the glycoside mixture in *D. purpurea*).**
Pharm. Weekbl. 1956 : **91** : 942–51.
In studies conducted at the Rijksuniversiteit, Groningen, Netherlands, three selfed lines of *D. purpurea* differing in botanical characters were found to differ in their constituent glycosides. Line 20, described as a digipurpurine type, contained digipurpurine constituting about one third of the total weight of gitoxin, together with small amounts of strospeside. The strospeside type, typified by line 15, contained large amounts of strospeside and no digipurpurine. Line Cambridge, a digitoxin type, had a high percentage of digitoxin, small quantities of gitoxin, together with strospeside as the main $\beta$-glycoside.

608 ATAL, C. K.
**Cytoplasmic male sterility in psyllium (*Plantago ovata* Forsk.).**
Curr. Sci. 1958 : **27** : p. 268.
A male sterile condition, recognizable by the shrivelled appearance of the anthers, was found to occur in wild and cultivated plants of *P. ovata* in Bombay State; these plants were female fertile. Normal plants gave normal progeny after either selfing or cross pollination, but when male sterile forms were pollinated by male fertile plants, the progeny were all male sterile. It was therefore concluded that the inheritance of male sterility is cytoplasmic. In the limited number of plants studied, no evidence of fertility-restoring genes was found.
Male sterility was also noted in *P. lanceolata*.

609 WISNIEWSKI, A.
Borrachas Amazônicas pouco conhecidas. **(Little-known Amazonian rubber trees).**
Bol. téc. Inst. agron. Norte. 1956 : No. 31 : 301–09.
Data are presented showing that rubber of good quality can be produced from *Micrandra siphonoides* and *Perebea guianensis*, whereas *Zschokkea* sp. produced rubber of low quality and the latex of *Landolphia boliviensis* and *L. paraensis* contained no rubber at all.

## FRUITS AND NUTS

**Abstracts of papers. XVth International Horticultural Congress, Nice, France, 11–18 April 1958** : Pp. 134.

610 *Nybom, N. Plant breeding by means of induced mutations.* (*p. 13*).

The general principles involved in the induction of mutations and their use in crop improvement were discussed.

611 *Brejnev* [*Brežnev*], *D. D. La situation actuelle et les perspectives des recherches scientifiques sur les cultures maraîchères en U.R.S.S.* (*The present situation and prospects of scientific research on market garden crops in the USSR*). (*pp. 13–14*).

Attempts are being made to produce fresh vegetables throughout the year in the USSR. Many improved varieties have been developed in recent years; attention is being paid to disease resistance and vitamin C and sugar content. Selection of types suitable for transport and storage is also carried out.

612 *Daskaloff, C.* [*Daskalov, H.*]. *Über die Ausnutzung der Heterosis bei manchen Gemüsekulturen in Bulgarien.* (*On the exploitation of heterosis in some vegetable crops in Bulgaria*). (*p. 14*).

A brief mention is made of investigations carried out in Bulgaria during the last 25 years on heterosis in tomato, paprika and egg plant; hybrids of these plants are widely cultivated and a method has been developed for the mass production of hybrid seed. Interspecific hybridization has been successfully used in tomato breeding. The hybrids 10 x Bison and Zarja [Dawn] x Komet [Comet] are the only early tomatoes cultivated.

613 *Bolsunov, I. Some methods for creation of high-yielding varieties of Solanaceae by fixation of heterosis-effect.* (*p. 15. Also in French and German*).

It is stated that, in breeding autogamous plants, the heterosis effect may be exploited not only in the first hybrid generation but also in subsequent generations. Investigations of *Nicotiana tabacum, N. rustica*, tomatoes and sweet pepper revealed that positive transgression with respect to yield is more frequent in the descendants of a heterotic $F_1$ than of a nonheterotic $F_1$. From $F_2$, $F_3$ and $F_4$ generations, selections were obtained which surpassed the $F_1$ in yield and vigour. The genetical causes of heterosis in autogamous members of the Solanaceae were discussed and new procedures for exploiting heterosis in autogamous vegetables and tobacco were described.

614 *Galun, E. On the physiology of sex expression in the cucumber.* (*p. 16*).

Change of sex in cucumber was brought about by chemical vernalization, the removal of young and adult leaves and grafting. These results are said to support the claim that sex expression in monecious plants is regulated by the internal balance between growth-promoting and growth-inhibiting substances.

615 *Jucci, C. Tomato breeding, through interspecific crosses, for disease resistance and for technological improvement.* (*p. 17*).

From crosses between commercial varieties of *Lycopersicon esculentum* and the wild species, *L. pimpinellifolium* and *L. hirsutum*, improved early types of tomato were obtained; some of these were suitable for making pulp.

616 *Clautrier, M.* (*p. 17*).

A list is presented of genetical and physiological studies being carried out on tomato at the Central Station of Plant Improvement at Versailles.

617 *Palocsay, R. Rôle de l'hybridation éloignée précédée du rapprochement végétatif préalable dans l'amélioration des tomates.* (*The role of distant hybridization preceded by previous vegetative rapprochement in the improvement of tomatoes*). (*p. 17*).

The author has spent ten years on effecting hybridizations between different varieties of tomato. Vegetative rapprochement by means of grafting was used to overcome resistance to hybridization.

618 *Roujitza, G. Nouvelles variétés de tomates obtenues par l'hybridation végétative.* (*New varieties of tomato obtained by vegetative hybridization*). (*p. 18*).

Jaune piriforme [Pear-shaped Yellow] was grafted on to Skopski; from the seed of the scion, the variety N45 was obtained. It is productive and the round red fruit has a good taste. The variety N51 was obtained from the seed of the scion in the graft of Skopski on Jaune piriforme. The fruits of N51 are red, pear-shaped, of good taste and suitable for canning.

619 *Sneep, J. Breeding hybrid spinach.* (*pp. 18–19*).

Difficulties encountered in breeding hybrid

spinach include the amount of work needed to rogue the male plants from the mother variety, the occurrence of various intersexual types in many varieties and the need for separating the male and female parents in harvesting and sowing. One suggested solution is the combination of a completely female round-seeded mother variety with a prickly-seeded father. On the basis of the hypothesis that male and female plants are determined by *XY* and *XX* respectively, together with the closely linked autosomal genes *Aa* for maleness and *Gg* for femaleness [cf. XXIV, 1494], a programme for producing commercial hybrid seed is outlined. Females of the constitution *XXaaGG* are increased by crossing with *XYaaGG* and are then crossed with the intersex *XXAAgg* to give the female type *XXAaGg*, which may then be crossed with appropriate males to give hybrid seed.

620 *Banga, O. Physiology of development and flower biology as factors in carrot breeding.* (*p. 19*).

After mentioning some environmental factors affecting germination, root development and bolting, the author notes that in all umbels the peripheral and central flowers are generally hermaphrodite and those of the intermediate zone tend to be male, and that the higher the order of the umbel, the lower the proportion of hermaphrodite flowers. Male sterility controlled by a cytoplasmic factor and one or more dominant genes have been found in some Netherlands varieties.

621 *Pecaut, P. Note sur la biologie florale de l'endive* (Cichorium intybus): *intercompatibilité et auto-incompatibilité.* [*Note on the floral biology of endive* (C. intybus): *intercompatibility and self compatibility*]. (*p. 20*).

Most plants are self incompatible, but a few self compatible plants have been found in Saint-Martin normale and Zwaan's vroege Mechelse [Zwaan's Early Mechelse]; their fertility after selfing is, however, lower than after crossing. Cross-compatible plants of these varieties fall into two groups: I, entirely cross compatible; and II, incompatible within the group but reciprocally cross-compatible with group I.

622 *Strachan, C. Factors concerned with quality evaluation of sweet corn varieties.* (*p. 30*).

Evaluation of eating quality at various stages of maturity was made together with analyses of moisture content and alcohol-insoluble solids and measurements of percentage pericarp, succulence and cut corn yield. Rates of change with advancing maturity were calculated for the different quality characteristics and were found to vary among varieties. The regression slope for either alcohol-insoluble solids or moisture content was useful in predicting the best harvesting time.

623 *Schreiber, F. Hereditary immunisation of beans.* (*p. 31. Also in French and German*).

The development of a new German dwarf bean, Schreibers Imuna, combining the anthracnose resistance of primitive varieties with the quality of garden varieties is noted; similar varieties with longer pods, called Longimuna and Grandimuna, have also been produced. Corresponding wax beans are Resista, Longresista and Grandresista.

624 *Hubbeling, N. Combined testing the resistance of beans* (Phaseolus vulgaris *L.*) *for five diseases.* (*p. 32. Also in French and German*).

Young seedlings are first tested with four races of *Colletotrichum lindemuthianum*; at the low temperature required, selection is possible some ten days later. Testing for resistance to common and yellow bean mosaic virus is effected in the survivors by rubbing the simple leaves with mixed juice from diseased plants together with carborundum powder. Two weeks later, resistance to stipple streak and halo blight is tested by rubbing the trifoliate leaves.

625 *Weiseth* [*Weisæth*], *G. Breeding for clubroot resistance in cole crops.* (*pp. 32–33*).

Results of crosses between susceptible Norwegian varieties and resistant plants indicate that resistance is determined by several recessive genes. Resistant plants are often self sterile.

626 *Gouchtchine, M. Y.* [*Guščin, M. J.*]. *Moyens et méthodes necessaires pour améliorer l'assortiment des fruits et des baies dans les R.S.S. d'Ukraine.* (*Means and methods necessary for improving the range of varieties of fruits and berries in the Ukrainian SSR*). (*pp. 39–40*).

Achievements by Mičurinist breeding methods in the Ukraine during the past 25 years are outlined.

627 *Luckwill, L. C. New developments in the study of graft incompatibility in fruit trees.* (*p. 42*).

Studies of grafts of the pears Bristol Cross and

Conference on clonal quince A rootstocks have shown that graft compatibility does not only depend upon the genetic constitution of the two components but may change with time. In some varieties it is possible to select compatible and incompatible strains from within the same clone. In studies of *Malus* species it has been found that in double-grafted trees the influence of an incompatible rootstock may be transmitted through a mutually compatible interstock.

628 *Rybin, W. A.* [*V. A.*]. *Artbastardierung als eine Methode der Untersuchung der Abstammung und züchterischer Verbesserung der Kulturpflaume* (Prunus domestica). [*Interspecific hybridization as a method of investigating the origin and breeding of the cultivated plum* (P. domestica)]. (*p. 44*).

In the USSR, sloe has been used to produce amphidiploids with other *Prunus* species.

629 *Crossa-Raynaud, P. Premières observations concernant une descendance $F_1$ d'hybrides d'abricotiers.* (*Preliminary observations on an $F_1$ progeny of apricot hybrids*). (*p. 45*).

In Tunisia, hybrids obtained by crossing Caninos with Amor Leuch and raised by artificial culture of the embryos showed marked differences, indicating that at least one of the parents is heterozygous.

630 *Cociu, V. & Pandele, I. A perspectivefull hybrid in apricots.* (*p. 46. Also in French and German*).

The hybrid Silistra x Ananas, produced in Rumania and now in its fifth year of fruiting, is very productive and resistant to frost. The fruits are rich in cellulose, making them resistant to damage during transport and handling, and have a high acidity, inherited from the female parent, which improves their keeping capacity. Sugar, pectic substances, proteins and minerals are paternally inherited. By means of suitable cultural treatment, the quality has been improved.

631 *Cociu, V. & Pandele, I. An early variety of peaches.* (*pp. 46–47. Also in French and German*).

Developed in Rumania from a cross between Chevreuse tardive [Late Chevreuse] and the ornamental variety Amazona rubicunda, this variety is superior to its parents in vigour, disease resistance, productivity and earliness. In chemical composition it is superior to most early varieties. Under steppe conditions, without irrigation, the quality of the fruit improves, particularly in sugar and vitamin C content.

632 *Bordeianu, T., Cupcinenco, I. & Pandele, I. A study of quince varieties grown in the Rumanian.* (*pp. 47–48. Also in French and German*).

Local varieties, studied over the period 1953–57, are characterized by vigour, productivity, and resistance to frost, parasites and insect pests. Those grown in the Danube delta are particularly rich in ascorbic acid. On account of their variation and richness in chemical constituents, some varieties are regarded as promising for breeding.

633 *Henze, J. Physiological investigations on the frost resistance in fruit-trees.* (*p. 55. Also in German*).

Studies of several species and varieties showed that frost resistance is related to some extent to the water content of the bark. Investigations on protein and carbohydrate metabolism suggested that pentoses may afford some protection by their effect on the water-retaining capacity of the protoplasm and its constituents.

634 *Zwintzscher, M. The frost behaviour of fruit trees in relation to development and heredity.* (*pp. 55–56. Also in French and German*).

The variation in heritability of frost resistance in fruit trees is emphasized and it is suggested that three components of resistance may be usefully distinguished, *viz.* the behaviour of the protoplasm at low temperatures, the duration of winter dormancy and the regeneration capacity.

635 *Lucka, M. Strawberry growing in Poland.* (*p. 64. Also in French*).

In tests of ten varieties, Oberschlesien [Upper Silesia], Climax and George Soltwedel gave the best yields while Ville de Paris, Afrique and Isabeline were most suitable for canning.

636 *Wierszylowski, J. G. Trials with raspberries in Poznan* (*Poland*). (*pp. 64–65*).

Of ten varieties tested in 1953–57, Rubin, Lloyd George, Malling Exploit, Malling Seedling Z and Souvenir de Paul Camenzind gave the largest crops and, with the exception of Malling Seedling Z, were also best for canning and other types of processing.

637 *Ross, J. M. The introduction of new material of* Hevea brasiliensis *to commercial planting.* (*p. 100. Also in French*).

In rubber selection work in Malaya, new clones

from hand-pollinated seedlings are first tested at the Experiment Station in small-scale trials of simple design and the most promising then undergo tests in large-scale trials set up throughout the planting districts of Malaya. The total testing period is 29–36 years.

XV^e Congrès International d'Horticulture. Nice – Printemps 1958. (**XVth International Horticultural Congress. Nice – Spring 1958**).
Rev. hort., Paris 1958 : **130** : 1.859–1.869.

638 *Chopinet, R. L'hétérosis.* (*Heterosis*). (*pp. 1.862–63*).
In a symposium on heterosis at the above congress, H. Kappert defined heterosis and pointed out the interest of heterosis for breeders and the difficulties encountered in its exploitation; reference was made to the production of hybrid seed of several vegetable crops. Explanations which have been put forward to explain heterosis were also mentioned.
O. Banga discussed the use of male sterility in the production of hybrid seed, reference being made to male sterility in onion [cf. XXVIII, 4794]. At Wageningen investigations are being carried out on the exploitation of male sterility in carrot.

639 *Trébuchet, M. Culture des légumes et des porte-graines.* (*Vegetable and seed stock growing*). (*pp. 1.863–65*).
Papers presented in this section have already been summarized [610–37].

640 Die Beerenobstzüchtung im Institut für Pflanzenzüchtung Bernburg. (**The breeding of berry fruit in the Bernburg Plant Breeding Institute**).
Dtsch. Gartenbau 1958 : **5** : 156–57.
In this popular illustrated account of the work of the above station, mention is made of the breeding of strawberries, raspberries and currants.

641 Kiss, F.
A bogyósgyümölcsűek új nemesítési eredményei. (**New results in breeding berry fruits**).
Agrártudomány 1958 : **10** : No. 4 : 35–37.
Suitability for deep freezing and other preserving methods is the chief current breeding objective in Hungary. In intraspecific crossing, the new strawberries E. export and E. korai [E Early] have been developed from crosses of Madame Moutot with Hansa, and E. óriás [E Giant] from Madame Moutot x Konsum. A new interspecific hybrid designated *Rubus mohacsyanus* is derived from crosses involving *R. idaeus* x *R. caesius* and *R. loganobaccus*.

642 Bolonjaev, A.
(**Orchards will blossom forth here**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 6 : 37–39. [Russian].
Breeding with fruit trees and soft fruits in Far Eastern territories is referred to briefly. The results include new varieties of apple, pear, cherry, plum, black currant and vine, characterized by high yield, hardiness and good or fair flavour. Among the apples are hybrids between hardy Reinettes and south European varieties and, among the pears, hybrids of *Pyrus ussuriensis* with south Russian pears, the latter hybrids being late in ripening and good in keeping properties. The cherries are mostly selections of *Prunus tomentosa* or its hybrids with *P. besseyi* and the plums selections of *P. ussuriensis* or hybrids between this and other species. Mention is made of several high-yielding and hardy vines bred at the Primor'e Horticultural Field Research Station.

643 **New Minnesota introductions.**
Fruit Var. hort. Dig. 1958 : **12** : p. 59.
**Apple.** Centennial (Dolgo crab x Wealthy) and Northland (McIntosh x Dolgo crab) have been introduced by the University of Minnesota. Ripening in late August or early September, the fruits of Centennial are deep yellow with red stripes. Earlier than Centennial, Northland bears small, bright red fruits with a purplish bloom. Both varieties tend to be biennial bearers. The fruits are suitable for several purposes.
**Gooseberry.** A seedling of Poorman, named Welcome, has also been released. It produces medium-sized, dull-red fruits with pink flesh and only a few small seeds. The almost thornless plants are vigorous, productive and relatively free from disease.

(**Biochemistry of fruits and vegetables. IV**).
Akad. Nauk SSSR, Moskva 1958 : Pp. 273. [Russian].

644 *Banajtis, Ju. I.* (*Study of the respiratory gas exchange in some apple varieties of the Lithuanian SSR*). (*pp. 59–68*).
Varieties such as Zarja [Dawn] and Litovskij Želtyj Riharda [Richard's Lithuanian Yellow], distinguished by good keeping capacity, released less $CO_2$ during storage at 5° C. than varieties of lower keeping capacity; Antonovka, in which

The poor keeping quality is conditioned by low air permeability of the skin, was characterized by a greater accumulation of $CO_2$ in the tissues during storage.

The differences in respiratory activity were more pronounced when measured on cut pieces than on the whole apples.

645 *Egorova, G. N.* (*Distinguishing features of citrus forms resistant to mal secco*). (*pp. 112–17*).

The peroxidase activity in the leaves was found to be 1·8 times higher in the Chinese lemon, which is resistant to *Deuterophoma tracheiphila*, than in the lemon Novogruzinskaja [New Georgian], which is susceptible. No difference was observed in the activity of catalase, polyphenoloxidase and ascorbinase. The acidity was lower in resistant forms such as Chinese lemon and Shiwa mandarin; in the susceptible forms the main acid was citric acid whereas in the resistant forms other acids were also present. The resistant species also contained more alkaloids, though lines of the lemon Novogruzinskij selected for higher alkaloid content were no more resistant to the fungus. The resistant species had a higher content of alkali-soluble proteins.

646 *Okanenko, A. S. & Berštejn, B. I.* (*Study of the biochemical characteristics of potato varieties resistant and susceptible to* Synchytrium endobioticum). (*pp. 118–42*).

In tubers of the susceptible variety Vale infected with wart a marked reduction in the content of amine nitrogen was observed in comparison with the uninfected control; no such reduction was detected in the resistant variety Grenzmark. Infected tubers of the susceptible varieties Vale and Lorh showed increases in content of dry matter and of total, protein and nonprotein nitrogen, little or no difference being observed in the resistant varieties Frühmölle and Grenzmark.

Similar differences were noted in a number of susceptible and resistant varieties grown in the field, there being a general reduction in amino-acid content in the tissues of infected tubers, except in the lesions where it was higher than normal. The leaves, stems and roots also had a higher content of protein nitrogen in the infected plants. Proteolytic activity was somewhat higher in the lesions than in normal tubers but no significant difference could be detected between resistant and susceptible varieties. Conversion of starch to sugars during storage at low temperatures was less in resistant than in susceptible tubers.

647 *Lipsic, D. V., Paškarj, S. I. & Rejngard, T. A.* (*The question of the biochemical characteristics of wart-resistant potatoes*). (*pp. 143–63*).

On contact with the spores of *Synchytrium endobioticum*, tubers of susceptible varieties displayed a marked increase in the respiration rate, whereas in resistant tubers the rate decreased slightly. No clear differences could be established in the oxidizing systems of susceptible and resistant varieties nor in the content of polyphenolic compounds, permeability of the protoplasm, isoelectric point or temperature of coagulation in healthy plants. The increase in glutathione content in infected tubers was greater in susceptible than in resistant varieties and in infected plants the resistance of the cytoplasmic colloids to coagulation was reduced in susceptible but not in resistant varieties.

648 Meier, G.
Der Einfluss von Blütenfrostschäden auf den Ertrag verschiedener Obstarten, Sorten und Baumformen auf dem Obstversuchsfeld Prussendorf. (**The influence of frost damage of blossom on the yield of various fruit species, varieties and tree forms at the Experimental Fruit Field, Prussendorf**).
Dtsch. Gartenbau 1958 : **5** : 129–32.

The effect of frost on varieties of apple, pear, plum and cherry is reported; for some of the apples and pears, the influence of tree height on frost damage was ascertained.

649 Vitkovskij, V. L.
(**Soft fruits in the Kola peninsula**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 54–57. [Russian].

**Raspberry.** Povirovskaja, Poljarnaja [Arctic] and Hibinskaja Krupnoplodnaja [Large-fruited Hibiny] were bred at the Arctic Research Station of the Institute of Plant Industry. They produce 0·4–1·0 kg. fruit per plant, ripen in August and are hardy under subarctic conditions. Other hardy material includes the local forms Hibiny and Kandalakša and the cultivars Novost' Kuz'mina [Kuz'min's Novelty], Spinin's seedling and Marlborough.

**Red currant.** The local forms Kandalakša and Varzuga are the best adapted to the local climate. They have large berries, rich in sugar and vitamin C, and yield 2–3 kg. per plant. Gollandskaja Krasnaja [Red Dutchman] was the only introduced European variety that

proved sufficiently hardy; it yields 3 kg. per plant.

**Black currant.** Hibinskaja Rannjaja [Hibiny Early], Hibinskaja Srednjaja [Hibiny Mid-season] and Hibinskaja Pozdnjaja [Hibiny Late] have been bred recently. They are hardy, ripen in August, and have an average yield of 1·5–1·7 kg. per plant. Primorskij Čempion [Littoral Champion] and wild forms from the Altaj, Pečora, Varzuga and Igarka basins are mentioned for their hardiness, the form from Igarka being the best in this respect. It has large berries and yields 2·5 kg. per plant. The fruit is large and has a high sugar and vitamin C content.

**Strawberry.** Among the varieties tested, Roščinskaja, Louise, Saksonka [Saxon] and Pobeditel' [Conqueror] were the hardiest, Roščinskaja ripening 10–15 days earlier than the others. Louise and Saksonka yielded the most fruit.

650 Wood, C. A.
**Apples at Mylnefield.**
J. Roy. Caledonian hort. Soc. 1957 : Pp. 11.

The collection of apple varieties at the Scottish Horticultural Research Institute station at Mylnefield is described; it includes many foreign as well as British types and some very old varieties. A trial of modern varieties is in progress and has already given useful information; mention is made of varieties which have given attractive fruit. The performance of the main commercial rootstocks in combination with various scions is also being studied.

651 Dibrova, P. A.
**(The apple variety Ščedraja).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 8 : p. 61. [Russian].

Ščedraja [Generous] is a seedling of Wealthy raised at Sverdlovsk. It is productive, resistant to scab and is hardy under Ural conditions. It ripens in September and has attractive fruits weighing 120 g. each.

652 Luce, B.
**Next month in the orchard.**
Bett. Fruit 1958 : **54** : No. 2 : 11, 15.

A brief mention is made of the new late-summer apple, Early Worcester. It is a cross between McIntosh and Worcester Pearmain. In maturity date, it comes between Early McIntosh and Standard Mack; it has firm flesh and is of good size and good eating quality.

653 Krasnoperova, A. E.
**(The apple variety Jubilejnoe).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 8 : p. 60. [Russian].

Jubilejnoe [Jubilee] (Baškirskij Krasavec [Baškir Beauty] x Bel'fler Kitajka [Bellflower crab]) was bred at the Baškir Horticultural Research Station. It is characterized by winter hardiness and regularly high annual yields. The fruits are smallish but their flavour is good. They ripen in September and keep till January.

654 Vigorov, L. I.
**(Retention of vitamins by apples in storage).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 8 : 56–58. [Russian].

The reduction in content of ascorbic acid and niacin in apples stored at varied temperatures for 1, 6 and 7 months was studied at Sverdlovsk, varietal differences being noted. New varieties from the Sverdlovsk Horticultural Research Station, notably Sport 45, Ščedraja [Generous], Ljubimec [Favourite] and seedling 71–12 showed little reduction in vitamin content after storage. Sport 45 was particularly rich in both vitamins.

655 Kramer, S.
Mitteilung über die Selbstfertilität beim Ontarioapfel. **(Information on self fertility in the Ontario apple).**
Dtsch. Gartenbau 1958 : **5** : 158–60.

Selfing the apple variety Ontario produced a fruit set of 6·8% in 1954 and 3·7% in 1955. It is suggested that self fertility results from a mutation of an *S* gene and that the mutation rate was greater in 1954 than 1955, this being related to the higher temperatures occurring during May in 1954. The variety Johannes Böttner, which also tends to be more self fertile than most other apple varieties, is descended from Ontario. Both these varieties tend to form parthenocarpic fruit; in Ontario, no seeds were found in parthenocarpic fruit.

656 Säkö, J.
Havaintoja eräiden syys- ja talviomenalajikkeiden mausta. **(Observations on the flavour of certain autumn and winter apple varieties).**
Valt. Maatalousk. Tiedon. 1957 : No. 235 : Pp. 6.

A large number of apple varieties have been sampled by a panel of five tasters and awarded points for flavour at intervals from October to April. The average values are given with the range of variation in the opinion of the member

of the panel. Early ripening varieties such as Early Worcester and Patricia head the list for the October sampling, the best keepers being Lobo (November-January), Åkerö (January-March), Linda (March-April) and Cortland (April).

657 Matsui, S., Ito, S. & Murata, N.
**(Studies on the manufacture of apple juice. I. Studies on the prevention of oxidative browning during manufacture).**
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 1–11. [Japanese].
Varietal differences in the above characteristic were among the matters investigated. Jonathan and McIntosh Red showed least darkening.

658 Leplinskaja, A. A.
**(The apple variety Pervenec Samarkanda).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 5 : p. 59. [Russian].
Pervenec Samarkanda [Samarkand First-born] (Landsberg Reinette x Samarkandskij Rannij [Samarkand Early]) surpasses Naliv Belyj [White Juice] and Persikovoe Letnee [Summer Peach], the standards in Uzbekistan, in quality, and is better adapted than these to local climatic and soil conditions. It ripens in June, being 10–12 days earlier than Naliv Belyj.

659 Woodhead, C. E.
**A survey of collar rot and root rot of Cox's Orange Pippin and other apple varieties in Nelson and Marlborough.**
NZ J. agric. Res. 1958 : **1** : 462–76.
The incidence of collar rot (*Phytophthora cactorum*) on Cox's Orange Pippin is markedly reduced where this variety is topworked on other varieties, Dunn's Favourite and Statesman being the most suitable. Single-worked trees of these and other varieties show a low incidence of collar rot, but *Phytophthora* root rot is common in trees of over 40 years of the varieties Delicious, Sturmer and Jonathan.

660 Pieniazek [Pieniążek], S. A.
Bericht von einer obstbaulichen Forschungsreise durch die Volksrepublik China. **(Report of a tour through the Peoples' Republic, China, in connexion with fruit cultivation research).**
Dtsch. Gartenbau 1958 : **5** : 194–96.
In the second article of this series, some of the fruit and nut varieties which are performing well in various parts of China are mentioned. A hybrid pear designated Pinge-li is described; it is a cross between *Pyrus ussuriensis* and *P. serotina*. This pear has juicy fruit with only a few stone cells; the average weight of the fruit is 150 g. and the keeping quality is good. Special mention is made of frost resistant apricots and peaches.

661 Ul'janiščeva, A. M.
**(The pear variety Desertnaja).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 8 : p. 61. [Russian].
Desertnaja [Dessert] (Bere Zimnjaja [Winter Beurré] x Lesnaja Krasavica [Forest Beauty]) was bred at Rossoš'. It is hardy, vigorous and has large fruit with soft, juicy and sweet flesh. It ripens in August.

662 Ul'janiščev, M. M.
**(The apricot variety Rossošanskij Krasavec).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 5 : p. 60. [Russian].
Rossošanskij Krasavec [Rossoš' Beauty] (Zolotoe Leto [Golden Summer] x Komsomolec) has fine quality fruit, with free stones, and is hardier than Krasnoščekij [Red Cheek].

663 Baldini, E.
Contributo allo studio delle cultivar di susino. **(Contribution to the study of the plum cultivars).**
Riv. Ortoflorofruttic. ital. 1958 : **42** : 200–33, 290–319.
Full descriptions, with illustrations, are given of 46 plum cultivars cultivated in Italy, some of them local varieties, others varieties introduced from other countries. In addition to morphological features, consideration is given to self and cross compatibility, time of ripening, origin and possible synonyms.

664 Vysockij, A. A.
**(The plum variety Trubčevskaja Pozdnjaja).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 8 : p. 61. [Russian].
Trubčevskaja Pozdnjaja [Trubčevsk Late] ripens in August to September. It is resistant to fungi and tolerant of temperatures down to — 39° C. The fruits are dark red with a waxy bloom, weigh 37–40 g. each, and have good consistency and flavour. Its transportability is good.

665 Tóth, E.
Élet- és alaktani összehasonlító vizsgálatok szilvafajtákon. (**Comparative physiological and morphological examinations of plum varieties**).
Kertész. Kutató Intéz. Évk., Budapest 1957 : **2** : 11–129. [From : Hungar. agric. Rev. 1958 : **7** : No. 2 : p. 6 (Abst.)].
Hungarian studies of 144 varieties during 1948–52 gave the following results. Flowering date showed greater dependence upon weather than upon variety. The period from the appearance of colour in the fruit to complete ripeness varied between 2 and 47 days according to variety. Self fertility was little affected by environment, but could be raised by 50% by means of hand pollination. Among 111 varieties, the highest percentage fertility was found in Zöldringló [Greengage] and the highest fertilization percentage is said to occur in Vörös szilva [Red plum]. Agenil, Olaszkék [Italian Blue] and Zöldringló were highest in nutritional value and Bódi had the greatest total resistance to insect and fungal pathogens.

666 Vorončihina, A.
(**The plum variety Nagrada**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 5 : p. 60. [Russian].
Nagrada [Reward] was obtained by open pollination of Renklod Kolhoznyj [Kolhoz gage] at Rossoš'. It is hardy and produces attractive fruits of pleasant flavour. The yield is consistently high.

667 Dzangalieva, S.
(***Prunus tomentosa***).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 5 : 58–60. [Russian].
Mention is made of seedlings selected for winter hardiness, productiveness and large fruit with an improved vitamin C content at the Kazah Agricultural Institute. Their sugar content varies from 7·06 to 14·4% and the acidity from 1·10 to 2·53%.

668 Blasse, W.
Zur Erblichkeitsanalyse von Artbastarden zwischen *Prunus cerasus* L. und *Prunus avium* L. (**Heredity analysis of interspecific hybrids between *P. cerasus* L. and *P. avium* L.**).
Arch. Gartenb. 1957 : **5** : 104–72.
Sixteen morphological characters were studied in 32 hybrids of fruit-bearing age and a marked predominance of maternal characters was noted. These characters seemed to be under polygenic control for all kinds of intermediates between the parental types were found. The hybrids were triploid with a chromosome number of $2n = 24$, 16 chromosomes coming from the female parent and eight from the male parent. Trivalents, bivalents and univalents occurred during meiosis and frequently eight chromosomes were left lying behind on the equator of the spindle. Tetrad formation was abnormal and pollen grains were of various shapes and sizes. Some of the hybrids were completely sterile whilst others were of low fertility. The germinating capacity of the pollen was under 1%. Hardly any fruit was set after selfing; pollination by other varieties resulted in a fruit set of about 2·6%. The embryos which formed soon degenerated as a result of cytological abnormalities. Flowering started in the hybrids after that of the sweet cherry but considerably earlier than in the sour cherry.
Fruit characters were also studied in detail; the majority of the hybrids had fruit of the sour cherry type and some were like Amarelle cherries; there were no sweet cherries. Two of the hybrids had fruit of particularly good quality as regards taste. None of the hybrids showed resistance to *Monilia* (*Sclerotinia*) *laxa*.

669 Kaz'min, G. T.
(**New intergeneric cherry-plum hybrids**).
Agrobiologija (Agrobiology) 1958 : No. 1 : 141–43. [Russian].
Hybrids 1–51–17 (*Prunus tomentosa* x *P. ussuriensis*) and 7–51–9 ([*P. besseyi* x *P. ussuriensis*] x *P. tomentosa*) were bred at Habarovsk. Hybrid 1–51–17 is hardy and produces large fruits resembling sour cherry in flavour. Hybrid 7–51–9 has larger fruits than *P. tomentosa* with which it has much in common. Both hybrids ripen in August.

670 Miščenko, O. H.
(**The pollination of new sour-cherry varieties**).
Sad. i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 52–54. [Russian].
Uluščennaja Ljubskaja [Improved Ljubskaja] is the only self-fertile variety among those recently bred at the Voronež Agricultural Institute. Žukovskaja, Černoplodnaja [Black-fruited], Gorškova 5 [Gorškov's 5] and Tambovčanka [sour cherry from Tambov] are partially self fertile, but each pollinated the other varieties. Good pollinators for each of the varieties are given.

671 FIORITO, G.
Le "percoche" napoletane. **(The Neapolitan "percoche").**
Ital. agric. 1958 : **95** : 489–92.

The group of peaches grown around Naples under the name *percoca* are distinguished by high quality and aroma, both for dessert and for preserving. They are more disease resistant and live to a greater age than more modern cultivars. A number of distinct types exist and are here described.

672 BARAK, D.
**(New varieties of peaches).**
Sadeh (Field)/Hassadeh 1958 : **38** : 679–81, 781–83, 887–90. [Hebrew].

Descriptions are given of the varieties grown, many of which are American introductions, and notes are added on the regions of Israel to which they are suited.

673 **Promising new varieties.**
Amer. Fruit Gr. 1958 : **78** : No. 9 : 14–15.

A new peach variety, Earlihale, has been jointly released for propagation by the US Department of Agriculture and Washington State College, Pullman. It is an early ripening, freestone peach of the J. H. Hale type and of possible value for transport. The yellow-fleshed fruit is medium to large in size, firm, medium-textured and of good flavour. Earlihale is susceptible to bacterial spot and pollen sterile.
Tejon, developed at the University of California, Riverside, is one of the earliest yellow-fleshed peaches and is particularly adapted to regions with warm winters such as may be found in parts of southern California.
Sunset is a clingstone peach reported to be especially suitable for canning; on account of its late ripening, 10 to 15 days later than Phillips, Sunset is available at the same time as other fruits used in fruit cocktail mixtures. This variety keeps well and is resistant to brown rot.
Regina is a freestone peach developed by the Crop Research Division of the US Department of Agriculture. It ripens at the same time as Redhaven but has proved more highly coloured, firmer and better in shape when tested in central California; it is recommended for trial planting in this region, where it may replace Redhaven.
Goldenred is to be released by the Oklahoma Agricultural Experiment Station in autumn 1960; it combines some of the good qualities of Elberta and Redhaven. This variety is of high quality and attractive colour; the flesh is yellow.

674 KAJIURA, M.
**(On progress in breeding peaches for canning).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 201–07. [Japanese].

Crosses between oriental peaches and Californian canning varieties have been made in order to produce varieties suitable for canning and adapted to Japanese climatic conditions. Four new varieties have been bred: Kanto 2 [Canning peach 2] (Early Elberta x Tuscan) x (Okayama 3 x Orange Cling); Kanto 5 (Kinto [Golden Peach] x Tuscan) x (Okayama 3 x Orange Cling); Kanto 12 (Kinto x Tuscan) x (Okayama 3 x Tuscan); and Kanto 14 (Okayama 3 x Orange Cling). These varieties mature in late July, early August, middle August, and middle August, respectively.

675 BROOKS, H. J. & HOUGH, L. F.
**Vernalization studies with peach embryos.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 95–102.

The above investigations were carried out at the New Jersey Agricultural Experiment Station in view of the fact that germination failure of seeds from early-ripening selections has proved to be a major obstacle in breeding. Vernalization increased the germination percentage of excised embryos of early-ripening selections cultured on nutrient agar + 2% sucrose.

676 LAUBER, J.-H.
Désirez -vous des fruits chinois? **(Do you want Chinese fruits ?)**
Rev. hort. suisse 1958 : **31** : 260–62.

Mention is made of a hybrid peach, Ken-da, which ripens at the end of November and withstands temperatures of — 30° C. Chinese breeders are paying considerable attention to the development of sturdy, late-flowering peach and apricot varieties for the north-east regions.

677 RUDKOVSKIJ, G. P.
**(Peaches from Kiev).**
Priroda (Nature), Leningrad 1958 : No. 5 : 101–02. [Russian].

Breeding peaches and nectarines at the Ukrainian Horticultural Institute, Kiev, is discussed. The results include ten hardy peaches differing with regard to maturation period, all of them selected among the fourth seedling generation of an unidentified variety. Mention is also made of more recent varieties of peach and of nectarines obtained by vegetative

or sexual hybridization. These are hardier still than the previous selections and some of the peaches have fruits weighing up to 250 g. The nectarines weigh up to 100 g.

678 Hough, L. F. & Bailey, C. H.
**Elbertita—a dwarf peach for home gardens.**
Fruit Var. hort. Dig. 1958 : **12** : p. 60.

Hough, L. F. & Bailey, C. H.
**Elbertita—a new dwarf peach for home grounds.**
NJ Agric. 1958 : **40** : No. 3 : p. 9.

Elbertita is a semidwarf, yellow-fleshed, clingstone variety introduced by the Department of Horticulture, Rutgers University, NJ, as an interesting type for domestic gardens. The tree is not more than one-third to one-half as large as a standard tree of Elberta, but it bears fruits as large or larger. Elbertita was selected from the open-pollinated progeny of a dwarf sport of Elberta.

679 Nishiura, M., Matsushima, J. & Okudai, N.
**(Studies on the kinds of citrus and on discrimination between sexual and asexual seedlings. I. Discrimination based on the colour reaction of extracts from the powdered leaves).**
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 19–26. [Japanese].

Numerous forms of *Citrus*, *Poncirus* and *Fortunella* were studied. Each form gives a specific response with Almen reagent. Nucellar seedlings give the same response as the mother plant and can therefore be differentiated in many cases from sexual seedlings which are liable to show a different colour response.

680 Tang, C.-Y.
**[The connexion between epidermal structure in citrus and susceptibility to *Xanthomonas citri* (Hasse) Dowson].**
Chih-wu Ping-li-hsueh Pao (J. Pl. Path.)/ Acta phytopath. sin. 1958 : **4** : 56–69. [Chinese].

The relationship between epidermal structure and susceptibility was studied in a series of Chinese citrus varieties. The shoots and fruits are liable to infection during active development but not after maturity. At the infective period, susceptibility is correlated with stomatal and lenticel frequency.

681 Feder, W. A. & Ford, H. W.
**Susceptibility of certain citrus varieties, species, and relatives to the burrowing nematode.**
Proc. Fla. hort. Soc. 1957 : **70** : 60–63.

A progress report of the results of testing for reaction to *Radopholus similis* is given [cf. 682–3].

682 Ford, H. W. & Feder, W. A.
**Procedures used for rapid evaluation of citrus for resistance to certain endoparasitic nematodes.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 278–84.

About 500 varieties and relatives of citrus fruits were screened for resistance to the burrowing nematode (*Radopholus similis*) in four months. Seedlings of each variety were planted in tanks and greenhouse benches in which large numbers of nematodes were maintained by successive croppings of okra and other susceptible annuals. The roots were examined after 3 weeks for visible lesions and the incubation assay technique was used to determine the number of nematodes present. Internal damage was estimated by a rapid chromium trioxide staining technique. Replicate seedlings of varieties showing a promising degree of resistance in these three types of test were inoculated with known numbers of nematodes in Petri dishes. The ability of the nematodes to penetrate the roots, lay eggs and maintain populations was determined after 5 days by means of a modification of an aceto-osmium staining procedure, and after 35 days by dissecting and counting the nematodes present in the root systems.

683 Feder, W. A. *et al.*
**Citrus varieties, species, and relatives susceptible to attack and damage by the burrowing nematode, *Radopholus similis*.**
Plant Dis. Reptr. 1958 : **42** : 934–37.

A comprehensive list of citrus species and their varieties, all susceptible to damage by *Radopholus similis*, is given. No tested material has been found immune, but the following varieties show some degree of tolerance: Pineapple and Sanguina grosse ronde sweet oranges, Cuban shaddock, Ichang and Ichangensis lemons, Sand Field citron, C18–E–7, C16–J–15 and C18–W–5 tangelos, Carrizo citrange, *Microcitrus australis*, Thomasville citrangequat and Lemelo.

684 Banfi, A.
Anotaciones sobre cierto material cítrico. **(Notes on some *Citrus* material).**
Idia 1958 : No. 123: 1–5.

Among anomalous forms observed at the Colonia Yeruá substation, Argentina, is a natural hybrid of rough lemon and trifoliate orange, with leaves which are trifoliate but otherwise similar to those of rough lemon. The plant remained undamaged by frosts of — 3·6° C. The other aberrations described include a double fruit on a mandarin and a sectorial chimera in the pomelo Thompson.

685 Culaja, V. I. & Šeftel', I. M.
**(The culture of citrus fruits in trenches in Central Asia).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 102–08. [Russian].

The Meyer lemon was the most productive among the lemon varieties tested at Vahš, Tajikistan, but the fruits of Lisbon and several other varieties were larger. Experiments on hybridization between the Meyer lemon and other varieties are in progress.

686 Milella, A.
Le cultivar di fico allevate in Sardegna. **(The fig cultivars grown in Sardinia).**
Riv. Ortoflorofruttic. ital. 1958 : **42** : 325–43.

On the basis of characters of leaf, stem, inflorescence and fruits, rhythm of development and time of ripening, descriptions with illustrations are presented for ten cultivars grown in the province of Sassari. Some are thought to have originated in the area and some to be introductions from other regions. Those considered most suitable for use as fresh figs and those for drying are indicated.

687 Whitaker, J. R.
**The ficin content of figs and fig latex.**
Proc. 12th. Annu. Res. Conf. Calif. Fig. Inst. 1958 : 4–9.

Variety was found to be a factor affecting the ficin content of the latex and figs.

688 Onozawa, Y.
**(Studies on the resistance of mulberries to snow. I. On intervarietal differences in the composition of the bark).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 186–90. [Japanese].

A comparative study of five Japanese varieties showed that resistance to the detrimental effect of snow cover was associated with a high ratio of insoluble carbohydrate/total sugars and a low soluble nitrogen content at the time of leaf fall.

689 Onozawa, Y.
**(Studies on the resistance of mulberries to snow. II. On the segregation of physiological characteristics in $F_1$ hybrids between resistant and susceptible varieties).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 231–34. [Japanese].

Eight crosses of the above type were effected. The $F_1$ hybrids showed a range in the ratio of insoluble carbohydrates/total sugars extending between the parental values. The correlation reported earlier between this ratio and resistance to damage by snow was shown by the $F_1$ progeny of one cross but not by that of another.

690 Mukherjee, S. K.
**Cytology of some Malayan species of *Mangifera*.**
Cytologia, Tokyo 1957 : **22** : 239–41.

Each of the two species investigated, viz. *M. foetida* and *M. caesia*, had $2n = 40$. Meiosis was studied in *M. foetida* and found to be regular. The length of the chromosomes at mitotic metaphase ranged from 0·6 to 2 $\mu$ in *M. caesia* and from 0·6 to 1·6 $\mu$ in *M. foetida*. In the former species, the complement consisted of 4 long, 10 medium and 26 short chromosomes and the total number of secondarily-constricted chromosomes appeared to be 6.

691 Tuz, A. S.
**(Anomalous flowering and fruiting of a walnut).**
Priroda (Nature), Leningrad 1958 : No. 5 : 91–92. [Russian].

A walnut found in Fergana province is mentioned for its hardiness, late-flowering habit and unusual form of inflorescence. This is 26–42 cm. long and has 8–25 female flowers situated proximally with the male flowers distal. The female flowers open in mid-May; the male flowers open during May-June. The tree forms more nuts per inflorescence than normal trees of *Juglans regia*.

692 Pelissier, P.
L'arachide au Sénégal. **(The groundnut in Senegal).**
Ét. Sénégal 1952 : No. 2 : 49–80.

A brief mention is made of the breeding of

varieties of groundnut suitable for Senegal conditions in progress at the Agronomic Research Centre of Bambey.

693 Canecchio Filho, V., Tella, R. de & Abramides, E.
Ensaios de variedades de amendoim. II – Oitava e nona séries de ensaios. **(Tests of groundnut varieties. II. Eighth and ninth series of trials).**
Bragantia 1957 : **16** : 139–45.

In further tests of the 16 varieties that proved best in the earlier trials [XXIV, 3332], good yields were again given by Roxo 40 [Red 40], Roxo 54 and Tatuí 76 and also by 89 and 87. The most popular among the growers is Tatuí 76 on account of the greater uniformity of its pods.

694 Canecchio Filho, V., Tella, R. de & Conagin, A.
Ensaios de variedades de amendoim. III – Décima e décima-primeira séries de ensaios. **(Tests of groundnut varieties. III. Tenth and eleventh series of trials).**
Bragantia 1957 : **16** : 303–13.

Further trials of groundnut varieties are reported, some of the varieties being the same as in the previous report [693] while some new introductions were substituted for the varieties less promising in the previous tests. The best results as regards yield and oil content of the seeds were from the American introduction named Paulista 269.

695 Tella, R. de & Canecchio Filho, V.
Ensaios de variedades de amendoim. IV – Décima segunda e décima terceira séries de ensaios. **(Tests of groundnut varieties. IV. Twelfth and thirteenth series of trials).**
Bragantia 1957 : **16** : 377–83.

In these further two sets of trials, Paulista 269 continued to have the highest oil percentage. It was exceeded in pod yield by Bandeirante 263, Centenário 264, Brasília 265 and Virgínia 266.

696 Raman, V. S.
**Studies in the genus Arachis - IV. Hybrid between *A. hypogaea* and *A. monticola*.**
Indian Oilseeds J. 1958 : **2** : No. 3 : 20–23.

Fertile hybrids were obtained from the cross *A. hypogaea* x *A. monticola*; the chromosome number of the hybrids was $2n = 40$. They were more vigorous than the parents and in general appearance resembled the female parent; in respect of hairiness, pigmentation and flower, branching, pod and kernel characters, the hybrids resembled the male parent.

697 Raman, V. S.
**Studies in the genus Arachis - II. Chromosome numbers of certain species of *Arachis*.**
Indian Oilseeds J. 1958 : **2** : No. 2 : 72–73.

Chromosome counts were made for several species of *Arachis*. For the first time, chromosome numbers are recorded for *A. duranensis* and *A. monticola*, these being $2n = 20$ and $2n = 40$ respectively. In *A. marginata*, it appears that there are some forms with 20 and others with 40 chromosomes.

698 Singh, D. & Singh, D. N.
**Effect of time of digging on yield and quality of groundnut.**
Indian Oilseeds J. 1958 : **2** : 75–81.

The effect of time of harvesting on yield, shelling percentage and oil content was investigated in some early and late varieties. The early varieties required between 110 and 120 days to mature fully and the late varieties required more than 120 days to give their optimum yield of oil. It is however difficult to allow groundnuts a growing period of more than 120 days in Uttar Pradesh. There is therefore a need to breed early varieties which equal the existing late varieties in yield and quality of oil.

699 Oakes, A. J.
**Pollen behavior in the peanut (*Arachis hypogaea* L.).**
Agron. J. 1958 : **50** : 387–89.

Investigations were carried out on pollen behaviour in the variety Spantex at the Texas Agricultural Experiment Station, in connexion with breeding techniques. Germination percentage on a sugar-agar medium increased as the temperature rose from 65° to 86° F. No germination was observed below 65° or above 95°. Growth of the pollen tubes was slow below 75° and above 90°. Significant disparities in viability were found between fresh samples of pollen collected in the field at different stages of physiological development, viability being highest in pollen collected at 5.00 and 7.00 hr. Pollen collected at 7.00 hr. remained viable for 8 days when stored in the whole flowers in open vials placed in desiccators over calcium chloride at 45° F. in an ordinary household refrigerator. Pollen collected at 3.00, 5.00 and 9.00 hr. remained viable for 6 days when stored under

similar conditions. Anthesis and pollination occurred between 5.00 and 6.00 hr. Fertilization took place 8–9 hr. after pollination.

700 Satyabalan, K.
**Coconut breeding for improved varieties.**
Bull. Indian cent. Cocon. Comm. 1958 : **12** : 72–80.

Coconut improvement in India by introduction of varieties, hybridization and mass selection is outlined.

701 Basso, M.
Contributo allo studio delle cultivar Toscane d'olivo. Indagini eseguite in provincia di Pisa. Le cultivar coltivate sui Monti Pisani. (**Research on the olive varieties of Tuscany. Investigations in the Pisa province. The olive varieties cultivated in the Monti Pisani area**).
Ann. Sper. agr. 1958 : **12** : No. 3 : Suppl. : xiii–liv.

Observations were made on date of flowering, floral morphology, percentage abortion of ovaries, fruit drop and self fertility in 13 cultivars, which are described and illustrated. Razzo [Rocket], Frantoio and Grossaio are classed as self compatible, the others being incompatible. Suitable pollinators for some of the cultivars are indicated.

The most widely cultivated variety in the zone is Razzo. The best are considered to be Razzo, Grossaio, Moraiolo, Leccino and Mignolo. Some of the cultivars comprise different clones and could probably be improved by selection.

702 Petruccioli, G. & Subbioni, F.
Primo contributo allo studio dei rapporti tra il contenuto di umidità e di zuccheri delle foglie dell'olivo e la resistenza al freddo. (**First contribution to the study of the relationships between humidity and sugar contents of olive leaves and resistance to cold**).
Ann. Sper. agr. 1958 : **12** : 945–81.

Analyses of the sugars in the leaves of five olive cultivars failed to provide conclusive evidence of a correlation between sugar content and cold resistance.

703 Janaki Ammal, E. K. & Sundara Raghavan, R.
**Polyploidy and vitamin C in *Emblica officinalis* Gaertn.**
Proc. Indian Acad. Sci. 1958 : Sect. B : **47** : 312–14.

Wild and cultivated forms of *E. officinalis* (= *Phyllanthus emblica*) with small fruits were found to have $2n = 98$. The basic number is considered to be $x = 7$. Cultivated varieties with large and medium-sized fruits had $2n = 98$–104. A wild tree with very small fruits and two local varieties, one with large and the other with medium-sized fruits, were chosen for analysis of ascorbic-acid content. The values obtained were respectively 411·549, 900·07 and 872·302 mg. per 100 g.

704 Sawant, A. C.
**Crossing relationships in the genus *Carica*.**
Evolution, NY 1958 : **12** : 263–66.

Crosses between the diecious species *C. monoica*, *C. goudotiana* and *C. cauliflora* and the diecious form of *C. papaya* were attempted. Observations on fruit set and drop, number of seeds per fruit, condition of seed and germination are recorded. The barrier to crossing operated at different stages according to the cross. In *C. cauliflora* ♀ x *C. monoica* ♂ the fruit dropped within a week, indicating that the pollen probably did not reach the ovule. When *C. goudotiana*, on the other hand, was used as ♀ parent in crosses with the other three species, the fruits remained on the plant for 2½ months or longer, the barrier to crossing being expressed as disharmonious growth of embryo and endosperm. The few normal seeds secured from *C. goudotiana* ♀ x *C. monoica* ♂ showed 5% germination. In the case of other crosses yielding apparently normal seed, either germination did not take place or an attempt to germinate the seed was not made. The most successful cross was *C. monoica* ♀ x *C. cauliflora* ♂, with 50–60% fruit set, 10–20 seeds per fruit and 10–15% germination [cf. 705].

705 Sawant, A. C.
**A study of the interspecific hybrid, *Carica monoica* x *C. cauliflora*.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 330–33.

In a study of the cross *C. monoica* (monecious) ♀ x *C. cauliflora* (diecious) ♂ at the University of California, Davis, the $F_1$ hybrids resembled the former parent more closely in habit of growth and morphology. Of the 23 $F_1$ plants, 10 were monecious and 13 males. The hybrids flower in 2½ months, remarkably earlier than *C. monoica* and *C. cauliflora*, which flower respectively in 4½–5 and 8–10 months. The hybrids are highly fertile, being a little more fruitful than *C. monoica* and definitely more so than *C. cauliflora*. The fruits are normal in

seed content and of the same size as those of *C. monoica*. The mode of sex inheritance is discussed.

706 Zerpa, D. M. de
Triploides de *Carica papaya*. (**Triploids of *C. papaya*).**
Agron. trop., Venezuela 1957 : **7** : 83–86.
A colchicine-induced tetraploid, described as a hermaphrodite of form C with flowers of type (IV +), was used as male parent in crosses with a diploid. The progeny, raised by means of embryo culture since the seeds had no endosperm, consisted of two triploids ($3n = 27$), both hermaphrodite, the one of form C with flowers (IV +) and the other of form B with flowers of types (IV +), II and III. The C triploid showed irregular meiosis with univalents, trivalents and bivalents; two metaphase II cells had a duplicate number of chromosomes.

707 Bergh, B. O.
**Avocado breeding in California.**
Proc. Fla. hort. Soc. 1957 : **70** : 284–90.
A popular review is given of the aims of breeding at the University of California stations at Los Angeles and Riverside and the selfing and hybridization techniques employed.

708 Čaročkin, M. M.
**(The results of varietal trials of raspberry in the north).**
Sad i Ogorod (Gdn.. & Veg. Gdn.) 1958 : No. 8 : 58–59. [Russian].
Novost' Kuz'mina [Kuz'min's Novelty] received the most points for combining winter hardiness, high yield and large fruit among the varieties tested at Vil'gort, Komi ASSR. Visluha [Drooping], Tekstil'naja [Textile] and Usanka [Moustache] were also hardy and had large fruit. The last two varieties are also mentioned for good transportability. Spirina Želtaja [Spirin's Yellow] is regarded as valuable breeding material on account of its large yellow berries of pleasant flavour and high degree of hardiness.

709 Petrahilev, I. M.
**(Interspecific hybrids of raspberry).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 138–40. [Russian].
Several hardy and productive hybrids, with large fruit of high quality, were obtained by crossing a wild red raspberry from Siberia with Marlborough at Murom. Seedlings 2–4, 28–2 and 8–2 are distinguished among them by yields exceeding 2 kg. per plant while seedlings 22–2 and 8–1 have specially large berries, weighing 3·7 g. and 3·6 g. respectively. Seedling 8–1 has white berries which are not pecked by sparrows.

710 Petrahilev, I. M.
**(Intergeneric hybrids of raspberry).**
Priroda (Nature), Leningrad 1958 : No. 8 : 109–11. [Russian].
An account of successful experiments on breeding *Rubus-Fragaria* hybrids at Murom is given. Incompatibility between the genera was overcome by the Mičurinist technique of using hybrids with shattered hereditary properties. In this instance the female component for the cross was provided by the interspecific raspberry hybrid, *Rubus melanolasius* x (*R. vulgatus* x *R. strigosus*), further shattered by transferring it to Murom from Krasnojarsk. The strawberry hybrid of Čudo Ketena (Keten Wonder) x Roščinskaja served as the pollen parent. The results of the cross include several plants regarded as intergeneric hybrids, notably seedling 1–3, which is distinguished by earliness, vigour, winter hardiness and large fruit of high quality; it yields up to 16 tons per ha. The breeding of new raspberry forms is being carried on by raising open-pollinated offspring of the hybrids or by back-crossing these to strawberry. Mention is made of an open-pollinated progeny of seedling 1–3. This showed variability in habit, leaf and berry shape, and in addition some plants bore white or yellow berries. Back crosses of another seedling, 5–3, to strawberry were obtained and are under observation.

711 Hylander, H.
Några nya eller kritiska *Rubi Corylifolii*.
**(Some new or critical *Rubi Corylifolii*).**
Bot. Notiser. 1958 : **111** : 517–34.
Diagnoses are given for newly recognized taxa designated *R. friesianus*, *R. internatus*, *R. sordirosanthus*, *R. allanderi*, *R. carlscronensis* and *R. gustafssonii*.

712 Lisavenko, M. A.
**(The black currant variety Altajskij Velikan).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : p. 62. [Russian].
Altajskij Velikan [Altaj Giant] was selected from a wild Siberian form. It has large berries of dessert quality, but it sheds these and its yield is low. However it proved valuable for crossing with European and Far Eastern varieties. New selections include (1) hybrids of Altajskij Velikan ♀ with Primorskij Čempion

[Littoral Champion] and Krasnojarka 606 [currant from Krasnojarsk 606] and (2) the hybrids of Saunders, Buraja Taežnaja [Brown Tajga] or Goliath ♀ with Altajskij Velikan as pollen parent.

713 Roščupkina, S. V.
**(The gooseberry variety Smena).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : p. 62. [Russian].

Smena [Change] (Haughton x Zelenyj Butyločnyj [Green Bottle]) was bred at Moscow. It ripens in August and is resistant to mildew and productive of berries weighing on the average 2·2 g. Their flavour is good. In recent trials it outyielded the standard Finik [Date].

714 Lee, W. R.
**Pollination studies on low-bush blueberries.**
J. econ. Ent. 1958 : **51** : 544–45.

The experiments described indicate that the honey bee is an effective pollinator of *Vaccinium lamarckii* and that this species is obligate for insect pollination. A large variation between clones in respect of the number of fruit set was noted both for plants growing in cages supplied with bees and for those growing under normal conditions. It was assumed that this variation resulted from physiological differences between clones.

715 Potapov, S. P. & Nitočkina, A. P.
**(Varietal trials of strawberry in the Moscow province).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 46–49. [Russian].

Komsomol was the most productive among the varieties tested at the Kolomenki Varietal Testing Ground, and Roščinskaja, Pionerka [Pioneer] and Krasavica Zagor'ja [Transmontane Beauty] ripened earliest. Pavlovskaja Krasavica [Pavlovsk Beauty], Leningradskaja Pozdnjaja [Leningrad Late] and Pozdnjaja iz Pavlovska [Pavlovsk Late] are mentioned for resistance to grey mould.

716 Žukovskaja, A. A. & Sin'kova, Z. A.
**(Varietal trials of strawberry in the Leningrad province).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 50–52. [Russian].

Komsomol, Obil'naja [Abundant] and Severnaja Urožajnaja [Northern Productive] were the most productive and hardy among the varieties tested at the Leningrad Varietal Testing Ground and Saharistaja [Sugar], Abrikosovaja [Apricot], Slavjanskaja [Slav] and Krasavica Zagorja [Transmontane Beauty] ripened early and had the finest flavour.

717 Sasaki, S. & Sato, T.
**(The characteristics of newly bred strawberry strains for cold regions. II).**
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1957 : No. 11 : 74–77. [Japanese].

Three new varieties suitable for northern Japan are described. Tohoku 5 [North-eastern 5] (Fairfax x Dorsett) is recommended for the attractive appearance of its bright red fruits. Tohoku 6 (Fairfax x Progressive) is of high dessert-quality in view of its sweet fruits with low acidity. Tohoku 7 (Dorsett x Fairfax) is the latest variety so far bred for the Tohoku region.

718 Kovacs, S.
Fajok közötti hibridizálás a *Fragaria* genusban. **(Interspecific hybridization in the genus *Fragaria*).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1956 : **9** : 291–93.

Research on the hybridization of strawberry since 1951 is described. The interspecific crosses *F. elatior* x *F. vesca*, *F. elatior* x *F. viridis*, *F. grandiflora* x *F. elatior* and their reciprocals produced a wide range of forms, all characterized by partial or total sterility in the first year; fertility developed gradually after various kinds of treatment, including (1) clonal propagation under different environmental conditions causing changes which affected the growing points, (2) induction of chromosome changes by means of exposure to extreme heat and cold, and (3) back crossing.

719 Duka, S. H.
**(The strawberry variety Kievskaja Rannjaja 2).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 5 : 60–61. [Russian].

The above variety has already been described [cf. XXVII, 2220].

720 Filosofova, T. P.
**[The strawberry variety Birjulevskaja Rannjaja (206-19)].**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 5 : p. 61. [Russian].

Birjulevskaja Rannjaja [Early Birjulevo]

(Komsomolka x Mysovka [Bay]) is hardy, moderate in its moisture requirement and ripens two days earlier than Roščinskaja. In four years its yield averaged 87 c. per ha. It produces large fruit of good flavour.

721 Kronenberg, H. G. & Wassenaar, L. M.
Juspa, een nieuw middentijds aardbeiras. **(Juspa, a new midseason strawberry variety).**
Fruitteelt 1958 : **48** : 756–57.

Developed at the Horticultural Plant Breeding Station, Wageningen, Netherlands, Juspa (Jucunda x Sparkle) resembles Jucunda in fruit shape and size and its readily detachable calyx, productivity, uniformity and low susceptibility to *Botrytis cinerea*, but is ten days earlier and its fruits are brighter in colour though less aromatic than those of Jucunda.

722 Suzuki, I., Sugahara, Y. & Todaka, S.
**(On the new strawberry variety Koro).**
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 27–35. [Japanese].

Hybridization work, mainly with American varieties, and trials of selected seedlings at the Tokai-Kinki research station are described. The variety Koro (Improved Marshall x Fairfax) has been released; it matures as early as the Japanese variety Kogyoko, is resistant to *Mycosphaerella fragariae* and *Phyllosticta fragariicola* and shows considerable tolerance of winter drought. It is recommended for warm regions in Japan.

723 Schiemann, E.
Beobachtungen an einem subfertilen *Fragaria*-Klon. **(Observations on a subfertile *Fragaria* clone).**
Planta 1958 : **52** : 77–95.

A clone obtained from a cross effected in 1923 between two octoploid garden strawberries, the female parent a derivative of *F. chiloensis* and the male of *F. virginiana*, was characterized each year by the production of malformed leaves during most of the season, followed by normal leaves at the end of the summer. Flowers were first produced in 1939; these were highly reduced and flowers with fertile anthers were not developed until 1950. Pollination of the flowers, either by selfing or crossing, did not yield any fruits. Back crosses made using the abnormal plant as pollen parent indicated that the anomalous condition of both leaves and flowers was probably conditioned by a single recessive gene.

724 McKeen, W. E.
**Races of and resistance to *Phytophthora fragariae*.**
Plant Dis. Reptr. 1958 : **42** : 768–71.

Ten isolates of *Ph. fragariae* obtained from a small area in the Saanich peninsula of Vancouver Is. differed widely in their pathogenicity on strawberry varieties. British Sovereign and Perle de Prague were resistant to certain isolates, although bred without consideration of resistance. Md.683, carrying the Scottish type of resistance derived from Scotland BK46, proved to be the most resistant variety, showing resistance to all ten isolates. At least six of the isolates are distinct in pathogenicity; they are tentatively designated C1 to C6. The importance of testing new resistant varieties with several races is stressed. Common indicator plants for determining races and a uniform system of racial numbering are also required.

725 Converse, R. H., Scott, D. H. & Waldo, G. F.
**Two additional races of *Phytophthora fragariae* Hickman in Maryland.**
Plant Dis. Reptr. 1958 : **42** : 837–40.

Five races of *Ph. fragariae*, designated A–1 to A–5, have been identified on the basis of their pathogenicity to the strawberry varieties Blakemore, Md.683, Aberdeen, Del Norte and Stelemaster. The designations A–1, A–2 and A–3 are suggested instead of "common race", A and S respectively. A–4 and A–5 are described for the first time.

726 Tabidze, D. I.
**(Viticulture in the Hungarian People's Republic).**
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1958 : No. 4 : 41–44. [Russian].

Breeding work with vines at Kecskemét and other places is referred to briefly. The results include Early Pearl, Attila and other new dessert and wine varieties, a new form of Riparia Portalis characterized by early-ripening wood, and hybrids of Seibel with local Hungarian varieties which combine pleasant flavour with resistance to mildew.

727 Cosmo, I.
Situation des travaux d'amélioration de la vigne et de sa culture. (Suite). Italie. Rapport national. [**The state of research on the improvement of the vine and its cultivation. (Continuation). Italy. National Report**]. Annu. Staz. Sper. Vitic. Conegliano 1956–1957 : **17** : Pubbl. No. 12 : Pp. 6. [Cf. XXVIII, 2225].

728 Loladze, V. R.
**(Breeding work with the vine variety Black Pinot).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : p. 66. [Russian].
The yield of Black Pinot has been improved by clonal selection at Muhrani, Georgia.

729 Komarova, E. S.
**(Central Asiatic vine varieties in the Ukraine).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 8 : 64–66. [Russian].
Terbaš and Kara Uzjum Ašhabadskij [Ašhabad Black grape] were among the few varieties which had high yields and ripened their wood under Odessa conditions.

730 Barrett, H. C.
**The best parents in breeding French hybrid grapes.**
Fruit Var. hort. Dig. 1958 : **12** : 39–42, 55–59.
Parental material used by French breeders is surveyed and discussed. The development of French hybrid grapes is considered as consisting of four stages: (1) the primary crosses from which the initial $F_1$ selections are obtained; (2) back crosses to *Vitis vinifera*; (3) intercrosses involving selections from (1) and (2) and further intercrosses of the resulting seedlings; and (4) crosses of the modern type of hybrids with *V. vinifera*. Tables are provided which denote the best parents at each stage and the progenies used in further breeding or as commercial varieties.

731 Dermen, H.
**Sterile hybrid grape made fertile with colchicine.**
Fruit Var. hort. Dig. 1958 : **12** : 34–36.

**Break on grape breeding.**
Agric. Res., Wash. 1958 : **7** : No. 11 : p. 11.
Tetraploid seedlings have been obtained from a colchicine-induced 4*x* branch of a hybrid of *Vitis vinifera* 'Malaga' ♀ x *V. rotundifolia* ♂. Putative 4*x* hybrids have been also produced by treating seedlings from this interspecific combination.

732 Ajvazjan, P. K.
**(The variability of vine seedlings under the influence of grafting).**
Agrobiologija (Agrobiology) 1958 : No. 1: 76–85. [Russian].
Morphological, biochemical, physiological and anatomical changes observed in some graft hybrids and their vegetative and sexual progenies at the Tairov Viticultural Institute are discussed. Mention is made of new forms, ten dessert varieties and three for industrial use, obtained by vegetative hybridization. All these are highly compatible with *Phylloxera*-resistant stocks, have a high yield and vigorous habit, and have grapes showing improved resistance to rot. One of the industrial forms is resistant to frost and mildew.

733 Del Gaudio, S. & Nico, G.
"Bianco d'Alessano". **(Alessano White).**
Ann. Sper. agr. 1958 : **12** : No. 3 : Suppl. : lix–lxiv.
The vine described produces a straw-coloured dry wine in the Taranto district of Italy.

734 Del Gaudio, S. & Nico, G.
**"Verdeca".**
Ann. Sper. agr. 1958 : **12** : No. 3 : Suppl. : lxv–lxx.
The vine described, known under various synonyms in the Taranto district of Italy, is gaining in popularity for mixing with Bianco d'Alessano [Alessano White] in the production of a dry white wine, slightly greenish in colour, and in the preparation of liqueurs.

735 Del Gaudio, S. & Ciasca, L.
"Somarello rosso". **(Red Somarello).**
Ann. Sper. agr. 1958 : **12** : No. 3 : Suppl. : lxxi–lxxvi.
The vines named Somarello [Little Ass], on account of their heavy yields, are thought to have been brought to the Brindisi region of southern Italy from Dalmatia. The red form here described serves for dessert and to a certain extent for wine making.

736 Cosmo, I., Comuzzi, A. & Sardi, F.
Indagini sulla ricostituzione viticola nella pianura della provincia di Padova. Terzo contributo. Zona alta di pianura. **(Studies on the reconstitution of the vineyards in the plain of the province of Padua. III. Upper plain zone).**
Ann. Sper. agr. 1958 : **12** : 693–725.
In this zone, not considered a typical vine area,

the best vine has almost invariably proved to be Merlot and the best rootstock Berlandieri x Riparia Teleki or Kober 5BB, which is a selection from it. Raboso Veronese has proved better than Raboso Piave in both yield and quality, having more sugar and less acidity.

737 Mel'nik, S. A.
**(Achievements in viticulture in the USSR).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 109–16. [Russian].

Mention is made of the principal varieties grown in the different viticultural areas of the USSR. These include many local varieties from Transcaucasus and Central Asia, introductions from southern and western Europe and new varieties bred at various Soviet institutes. Among the latter are high-yielding dessert vines such as Pobeda [Victory], Rannij VIRa [Early Institute of Plant Industry] and Muskat Uzbekistanskij [Uzbekistan Muscat] from Central Asia and the winter-hardy varieties Zarja Severa [Dawn of the North], Severnyj [Northern] and several others which have been bred at the Viticultural Institute of the RSFSR. Worth mention also are high-yielding clones of Rkaciteli, Saperavi and Budešuri, selected in Armenia.

738 Popov, N. N. & Burštejn, A. N.
**(Experimenting viticulturists. Participants in the All-Union review of vines in 1957).**
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1958 : No. 4 : 34–35. [Russian].

Mention is made of a seedling, Saratovskij Rekord [Saratov Record], notable for productiveness and large bunches and other new hybrid vines, mainly interesting for hardiness. They include seedlings 109–50–19 and 121–50–21, both from Russkij Konkord [Russian Concord] x Lin'jan, which form bunches weighing up to 600 g. Seedling 211–50–36 is mentioned for its large grapes and seedling 228–50–39 for high yielding capacity. Most of these varieties have perfect flowers and ripen in August.

739 Evtušenko, A. F.
**(USSR conference on *Phylloxera* and mildew resistance of the vine).**
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1958 : No. 5 : 60–61. [Russian].

This report on a conference held in April 1958 at Kišinev refers to forms resistant to *Phylloxera* and mildew which have been obtained by intervarietal or interspecific hybridization at various Soviet institutes. No details are given except that some have berries of fine quality.

740 Krimbas, B.
La dégénérescence infectieuse de la vigne. **(Infectious degeneration of the vine).**
Bull. off. int. Vin 1958 : **31** : 7–24.

Observations are reported on the susceptibility to vine roncet virus of the scion varieties in the ampelographic collection at Athens. Savvatiano has proved highly resistant and several other varieties have only shown slight symptoms.

## FOREST TREES

741 Darmer, G.
Aufgaben der Gehölzzüchtung im Dienst flurschützender Landschaftsgestaltung. **(Problems of breeding trees for the purpose of conservation).**
Dtsch. Gartenbau 1958 : **5** : 116–20.

A more extensive discussion of this matter has been summarized elsewhere [cf. XXVIII, 3413].

742 Årsberättelse över Föreningens för växtförädling av skogsträd verksamhet under 1957. **(Annual report on the work of the Association for Forest Tree Breeding in 1957).**
Årsberätt. För. Växtf. Skogstr. 1957 : 1–17.

*Ekebo Station*

**Aspen.** Hybrid aspens are being compared, particular attention being paid to differences in resistance to *Valsa nivea*. The parents are *Populus tremuloides* from North America and *P. tremula* from Sweden and Poland.

**Alder.** Triploids ($2n = 42$) of *Alnus glutinosa* are more rapid in growth than the initial diploid form ($2n = 28$) but are liable to wind damage in late summer because of the insufficient lignification of the young shoots. Diploids and triploids of *A. rubra* x *A. glutinosa* are also under study. These hybrids grow rapidly and are resistant to autumn frosts.

**Pine.** Mother pines from various provinces in Sweden have been crossed with pollen parents from other European countries and Siberia, with the aim of seeing whether hybrids between trees of widely different provenance exhibit heterosis.

**Larch.** A plantation consisting of clonal mother trees of Japanese larch surrounded by ten different clones of European larch as pollen parents has been established for the production of hybrid larch seed. At Stehag, the hybrids

*Larix leptolepis* x *L. decidua*, *L. sibirica* x *L. leptolepis* and *L. gmelini* x *L. leptolepis* are being studied for suitability for growing together with aspen.

*Brunsberg and Sundmo Stations*

Studies of hybrids between spruce parents of different provenance and of interspecific larch hybrids continued at both stations. Work at Sundmo also included provenance trials of pine and birch and tests of hybrid aspens. Hybrids between pines from Norrland in northern Sweden and pines of more southerly origin are expected to combine rapid growth with hardiness and to be promising for nothern regions.

**Proceedings of the 5th Northeastern Forest Tree Improvement Conference held at Orono, Maine, August 22-23, 1957** (1958). Pp. 86. (Mimeographed).

743 *Gabriel, W. J. Summary of forest tree improvement work in the northeast.* (*pp. 3–5*).

A list of organizations in the north-eastern United States carrying out research programmes on various aspects of forest tree improvements is given, based on answers to questionnaires.

744 *Jensen, V. S. Improvement work with eastern white pine in the northeast.* (*pp. 6–10*).

Research projects concerned with improvement of *Pinus strobus* and studies of other white pines in the north-eastern United States are listed, together with the organizations responsible.

745 *Rudolf, P. O. Highlights of current forest tree improvement activities in the Lake States.* (*pp. 11–13*).

Ten agencies in the Lake States (Minnesota, Wisconsin and Michigan) are conducting forest-tree improvement research. A list of the activities of each is given.

746 *Wakeley, P. C. Summary of forest tree improvement work in the south.* (*pp. 14–19*).

A brief survey is given of tree improvement work in various institutes in the southern United States with mention of the principal species and research objectives involved.

747 *Duffield, J. W. Summary of forest tree improvement work in the Pacific Northwest.* (*pp. 20–21*).

A brief summary of research work in improvement of Douglas fir, Sitka spruce and western white pine carried out in the Pacific Northwestern States is given, with mention of other minor lines of research.

748 *Righter, F. I. Summary of forest tree improvement work in California.* (*pp. 22–24*).

A brief survey is given of research on racial variation, hybridization and selection in several species of *Pinus* carried out at research centres in California.

749 *Heimburger, C. Forest tree breeding work in Canada.* (*pp. 25–27*).

Sources of information on Canadian forest-tree breeding are listed, together with the organizations responsible.

750 *Schreiner, E. J. Genetic improvement conversion.* (*pp. 29–42*).

A method of improving the genetic stand potential of a 1-acre demonstration plot is outlined, which fits in with the sylvicultural, genetical and present economic limitations of the spruce-fir forests in New England.

751 *Patton, R. F. & Riker, A. J. Blister rust resistance in eastern white pine.* (*pp. 46–51*).

Experiments on the inheritance of resistance to blister rust in eastern white pine and on propagation of resistant individuals are described. Grafts were made and seed collected from a number of possibly resistant individuals. None of the grafts were immune but about 25% were highly resistant and are being used for breeding. The progeny showed a high degree of infection. The breeding programme included crossing between resistant trees and hybridization with related soft pines. Early results show a low proportion of resistant individuals in the $F_1$.

752 *Rudolf, P. O. & Nienstaedt, H. Spruce improvement research at the Lake States Forest Experiment Station—an outline.* (*pp. 54–57*).

The programme for spruce improvement is outlined. This includes racial variation studies and selection.

753 *Diller, J. D. Natural selection of blight-resistant American chestnuts appears promising.* (*p. 69*).

A brief account is given of the investigation of

reported instances of surviving chestnuts which are possibly naturally resistant to chestnut blight, and the next steps for using these in a breeding programme are outlined.

754 Koldanov, V. Ja.
**(Square planting of trees and the union of their roots).**
Bot. Ž (Bot. J.), Moskva 1958 : **43** : 713–20. [Russian].

Figures are given showing that the square planting of forest trees, referred to in a recent article by T. D. Lysenko [cf. XXVIII, 3722–3], has not been successful and has now been discarded, the loss being estimated at 1,000,000,000 roubles. One of the reasons for the failure, it is submitted, is that the method was proposed on theoretical considerations, without sufficient experimental data and with insufficient knowledge of sylvicultural principles.

755 Ferré, Y. de
Revue de gymnospermie. Problèmes actuels relatifs aux conifères. (**Review of gymnospermy. Current problems concerning the conifers**).
Bull. Soc. bot. Fr. 1958 : **105** : 155–205.

This review includes a brief mention of studies on the floral biology, hybridization and cytology of conifers.

756 Schreiner, E. J.
**Possibilities for genetic improvement in the utilization potentials of forest trees.**
Silv. genet. 1958 : **7** : 122–28.

This broad discussion is concerned with the characteristics and qualities which determine the value of forest trees for special uses. Characteristics which are apparent in the tree or log and other physical, chemical and anatomical characteristics affecting wood quality are listed. The heritability where known is mentioned and possible improvement procedures of a genetical or sylvicultural nature are suggested.

757 Barnes, B. V.
Erste Aufnahme eines sechsjährigen Bestandes von Aspenhybriden. (**First survey of a six-year old stand of hybrid aspen**).
Silv. genet. 1958 : **7** : 98–102.

Two populations of hybrid aspen were surveyed at Escherode and significant differences at the 1% level were found in diameter at breast height (DBH), total height and branch angle. The best population at this age was a cross between *Populus tremula* from E. Saxony and *P. tremuloides* from the USA, the other hybrid being a cross between Swedish *P. tremula* and Canadian *P. tremuloides*.

Only slight correlations were found between branch angles and DBH, height, or the ratio height/DBH; a close correlation existed between the latter three characters and branch diameter. The crowns of the trees showed a variety of form in both populations; catkins were only found on six trees, these being of the Swedish x Canadian cross.

758 Seitz, F. W.
Frühtreibversuche mit Blühreisern der Aspe. (**Experiments on early development of flower bearing branches of aspen**).
Silv. genet. 1958 : **7** : 102–05.

Treatment with low temperatures has been successfully used to bring about early opening of the flower buds in a male aspen.

759 Polster, H. & Reichenbach, H.
Ein Verfahren zur Prognose der vitalen Dürreresistenz durch Ermittlung des Stomata regulations vermögens abgeschnittener Pflanzensprosse. (**A procedure for the prognosis of vital drought resistance using the capacity for stomatal regulation of detached plant shoots**).
Biol. Zbl. 1957 : **76** : 700–21.

Cuttings of *Populus berolinensis*, *P. trichocarpa*, *P. bachelieri*, *P. vernirubens* and *P. eugenei* were grown for two months in soils containing 80, 50 30 and 20% water. Transpiration and the ability of the stomata to react to intermittent light were then measured.

In the first two species (group I) stomatal regulation of transpiration rate continued for 30–50 minutes in plants grown at 80 and 50% saturation, fell off rapidly at 30% and failed to occur at 20%; in the other three species (group II) stomatal regulatory movements ceased at 30%. The shoots of the last three lost appreciably less water than those of the first two. Both groups grew well at 80 and 50%, but group II was poorer in growth at 30% than group I. Similar differences in growth between the two groups were found in field trials on soils of different humidity.

Determination of stomatal reaction is therefore regarded as a suitable method of testing for

drought resistance. It is noted that the most drought-resistant species are balsam poplars.

760 VAN DEN ENDE, G.
Verslag van het onderzoek naar de populierenkanker in de jaren 1954, 1955 en 1956 veroorzaakt door *Pseudomonas syringae* v. Hall *populea* Sabet. **(Report on research on poplar canker in the years 1954, 1955 and 1956, caused by *Ps. syringae* v. Hall *populea* Sabet).**
Meded. ned. Heidemaatsch. 1957 : No. 24 : 1–12.

The behaviour of seedlings of 100 crosses inoculated in the Netherlands in the years 1951–54 and inspected in the year following inoculation are reported [cf. XXVIII, 2274 and 4746]. Crosses involving *Populus nigra* or *P. nigra* var. *italica* gave the highest proportion of resistant seedlings and *P. tremula* seedlings of Polish origin also gave resistant progeny in some crosses. Of introduced clones and hybrids, the following were resistant: B84 *P. robusta* Welte I; B99 *P. catyana*; B103 *P. sacrau*; B108 *P. caroliniana*; and *P. angulata*. Satisfactory resistance was found also in *P. rubra* Polen, *P. tremula* x *P. tremuloides*, *P. robusta* AE, *P. deltoides* Zd. Illinois and a type referred to as the Selys poplar.

761 BLINKENBERG, C., BRIX, H., SCHAFFALITZKY DE MUCKADELL, M. & VEDEL, H.
**Controlled pollinations in *Fagus*.**
Silv. genet. 1958 : **7** : 116–22.

A further report is presented on pollination experiments in progress at the Hørsholm Arboretum, Denmark [cf. XXIV, 2472]. It has been found advantageous to mix a large quantity of *Lycopodium* spores with the small quantity of *Fagus* pollen that is usually available. As previously reported, *F. sylvatica* shows considerable self sterility although individual trees may be fairly self fertile; the degree of self fertility may vary from year to year. Fertilization was generally good when *F. sylvatica* was crossed with *F. orientalis*. A number of hybrids were raised from crossing *F. sylvatica* ♀ with *F. grandifolia* ♂. The leaf of the hybrid seemed to be intermediate in form; there was a tendency towards greater juvenile vigour as compared with *F. sylvatica* but it was not possible to determine whether this was a true heterotic effect. Four one-year-old hybrids from the cross *F. sylvatica* x *F. sieboldii* were bred.
When crosses were made between green and copper beeches a segregation of 1 : 1 was obtained in the $F_1$ with respect to the two colour forms; this indicated that monofactorial segregation took place. It is believed that the copper beeches studied were heterozygous with the genotype *Cg*; the gene for copper is dominant over the gene for green. With a view to simplifying the technique used for artificial pollination, a method was devised for testing the purity of progeny arising after pollination without bagging and emasculation. An early flowering, protogynous, green tree is hand pollinated with pollen from a copper beech as soon as the stigmas become receptive. If the segregation ratio for the two colour forms is similar to that obtained using the normal bagging technique, very little open pollination from neighbouring trees is occurring. The number of copper plants in the progeny is multiplied by two to give the approximate number of plants with a copper parent. It is assumed that the progeny will be of similar purity, if a green male parent is then used instead of the copper beech. Observation made on scattered beeches revealed that wind is an effective pollinating agent.

762 BIAŁOBRZESKA, M.
Właściwości morfologiczne i biologiczne brzozy ojcowskiej, brzozy brodawkowatej i ich mieszańca. **(Morphological and biological characters of *Betula oycoviensis*, *B. verrucosa* and their hybrid).**
Roczn. Sekc. dendrol. polsk. Towarzyst. bot., Warszawa 1955 : **10** : 165–89.

Biometrical studies of the above birches showed that the hybrid resembled the second parent in leaf characters and the first in fruit characters, while its scales possessed some of the characters of each parent. The hybrid was less variable than either parent in fruit and scale type. Seed germination was best in the hybrid and poorest in *B. oycoviensis*. The pollen of the hybrid and *B. oycoviensis* was highest in starch content, that of the latter showing the highest germination percentage and that of the hybrid an intermediate value.

763 VASIL'EV, V. N.
**(The Bajkal-Sajanskij region as one of the principal late centres of formation of the genus *Betula* L.).**
Trud. Inst. Lesa (Trans. Inst. For.) 1958 : **37** : 120–41. [Russian].

Descriptions of eight new species, *Betula henriettae*, *B. pseudomiddendorffii*, *B. vladimirii*, *B. tiulinae*, *B. transbaicalensis*, *B. sajanensis*, *B.*

*pseudopendula* and *B. jacutica*, found in the above region, are given.

764 Richens, R. H.
**Studies on *Ulmus*. II. The village elms of southern Cambridgeshire.**
Forestry 1958 : **31** : 132–46.

A taxonomic survey of 132 elm samples from southern Cambridgeshire is presented. From a comparative study of eight biometric foliar characters, the samples could be classified into 7 biometrically defined groups, 6 pertaining to *U. carpinifolia* and 1 to *U. procera*. Samples intermediate between the two species were also found.

Historical evidence concerning these groups is assembled. At least two introductions of *U. carpinifolia* into Cambridgeshire seem to have occurred, one of which appears to have been no later than Roman and the other no later than medieval. *U. procera* was introduced no later than in the Middle Ages. [Cf. XXV, 2413].

765 Kobendza, R.
Mieszańce naturalne olszy szarej i czarnej w Polsce (*Alnus incana* Moench. x *A. glutinosa* Gaertn. = *A. hybrida* Alex. Braun). [**Natural hybrids between grey and black alder in Poland (*A. incana* Moench. x *A. glutinosa* Gaertn. = *A. hybrida* Alex. Braun)**].
Roczn. Sekc. dendrol. polsk. Towarzyst. bot., Warszawa 1956 : **11** : 133–49.

Specimens of the above hybrid found on the banks of the Vistula are described. They show a wide range of types between the two parent forms, with differences in leaf shape, petiole length, distribution of hairs and other leaf characters. The $F_1$ hybrids are characterized by their vigour.

766 Ashton, D. H.
**The ecology of *Eucalyptus regnans* F. Muell: the species and its frost resistance.**
Aust. J. Bot. 1958 : **6** : 154–76.

A short account is given of *E. regnana* ($2n$ = 22), with reference to its distribution in Victoria and Tasmania, habit and phenotypic variation in tree and seedling characters. Marked variation in seedling growth is a conspicuous feature, both in the field and under relatively uniform environmental conditions in the glasshouse. Probably genetical variability plays an important role in the rapid thinning of dense, even-aged stands arising after bush fires. Data on the oil glands, odour of the oil, leaf characters and presence or absence of lignotubers, indicated that *E. regnans* almost certainly forms hybrids with *E. obliqua*. Ecoclines exist in the *E. regnans* populations in south-central Victoria, the seedlings showing a gradation in both frost resistance and growth rate along altitudinal gradients. Seedlings derived from trees growing at the edge of a frost pocket at Wallaby Creek (2000 ft.) combine fast growth rate with a relatively high degree of frost resistance which equals that of seedlings from seeds collected at 3700 ft. The greater resistance of the seedlings from the frost hollow, compared with material derived from comparable altitudes, is probably the result of selection within a genetically heterogeneous population when the frost-hollow grasslands were formed 50–70 years ago through logging and bush fires.

767 Nikolaeva, M. G.
**(The biology of germination of *Fraxinus* seeds and its bearing on the taxonomic position and distribution of its species).**
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 679–83. [Russian].

The species can be divided into five groups according to the type of germination of the seed, the first group having no dormancy and the fifth requiring prolonged stratification. The grouping on this basis corresponds to the geographical distribution of most of the species; the fifth group comprises species of section *Bumelioides* of the subgenus *Fraxinus*, all thought to be of recent origin. From this point of view *F. spaethiana* would appear to belong to subgenus *Ornus* rather than subgenus *Fraxinus*.

Seeds of *F. excelsior* of southern provenance have relatively large embryos and low stratification requirements; this is thought to be the true type of the species and northern forms with small embryos requiring long periods of stratification are regarded as derived types.

768 Suda, Y.
**The number of chromosomes in some Japanese salicaceous plants 1.**
Sci. Rep. Inst. Res. Inst. Tohoku Univ. 1958 : **24** : 1–4.

The chromosome numbers reported include the following: *Salix chaenomeloides*, *S. subfragilis*, *S. bakko*, *S. vulpina*, *S. lackschewitziana*, *S. gracilistyla*, *S. melanostachys*, *S. leucopithecia* and *S. sirakawensis*, $n$ = 19; *S. kinuyanagi*,

$n = 22$; and *S. matsudana* var. *tortuosa* and *S. gilgiana*, $n = 38$.

769 Shidei, T.
**(On the distribution of races of *Cryptomeria japonica* in natural stands in the region of the Osaka Forestry Office).**
Nihon Ringaku Kai Shi/J. Jap. For. Soc. 1957 : **39** : 270–78. [Japanese].
An account is given of the variation shown by 39 samples collected in the above region. The principal characters studied comprised the morphology, colour and hardness of the needles and timber and bark characters. Two races are differentiated.

770 Toda, R.
**Variation and heritability of some quantitative characters in *Cryptomeria*.**
Silv. genet. 1958 : **7** : 87–93.
By comparing the variance in a stand of *Cryptomeria* seedlings with that in a stand originating from cuttings of a vegetative race, it was found that the relative amount of total genetic variance (i.e. heritability in its broad sense) was high in the seedling population in respect of tree height, stem girth, stem taper, crown diameter, bark thickness and the angle of the longest branch. Although certain sources of error are thought to have resulted in overestimation of the heritability values, considerable increase in timber production is possible by selection. For example mass selection of the top 5% of a population and propagation of the selected trees by cuttings is expected to give a 43% increase in the volume of wood produced. Clonal selection would increase the rate of improvement. It was not possible from the available data to determine the relative amount of additive genetic variance (i.e. heritability in its narrow sense). From Stern's data on Scots pine [cf. XXIII, 2232], additive genetic variance was roughly estimated to be one-third of the heritability in the broad sense. Thus when selected trees are propagated by means of élite seed orchards, the effect of selection is one-third of that obtained when the selections are vegetatively propagated.

771 Durrieu-Vabre
Chromosomes de *Pseudotsuga Douglasii* Carrière. **(Chromosomes of *Ps. Douglasii* Carrière).**
CR Acad. Sci., Paris 1958 : **246** : 3660–63.
The number $2n = 24$ is confirmed for the above species. In *Pseudolarix kaempferi* the somatic number is also about 24.

772 Nishimura, S.
**(The characteristics of seedling trees raised from seed of *Sequoia sempervirens* obtained from California).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **7** : 145–51. [Japanese].
Fifteen seedling trees are described. They varied greatly in habit and growth rate.

773 Habeck, J. R.
**White cedar ecotypes in Wisconsin.**
Ecology 1958 : **39** : 457–63.
Germination tests and observations on seedling development under different soil conditions provided evidence of upland and lowland ecotypes of *Thuja occidentalis*. Both ecotypes may occur within a relatively small geographical area.

774 Holzer, K.
Die Zirbe in der Forstpflanzenzüchtung. **(*Pinus cembra* in forest-tree breeding).**
Allg. Forstztg. 1958 : **69** : 156–57.
Breeding of *P. cembra*, which is particularly suited to high altitudes and is being used to extend the present tree limit in the Austrian Alps, has been initiated at the Mariabrunn Forestry Research Institute and other stations in Austria.

775 Wright, J. W. & Gabriel, W. J.
**Species hybridization in the hard pines, series *Sylvestres*.**
Silv. genet. 1958 : **7** : 109–15.
At the Northeastern Forestry Experiment Station, Upper Darby, Pa., a large number of species crosses within the pine series *Sylvestres* were attempted and 23 were successful; descriptive notes based on second-year performance in the nursery are provided for these hybrids, diagnostic characters being mentioned. The two-year old seedlings of *P. thunbergii* x *P. densiflora*, *P. thunbergii* x *P. taiwanensis*, *P. thunbergii* x *P. massoniana*, *P. thunbergii* x *P. nigra* var. *austriaca*, *P. densiflora* x *P. thunbergii*, *P. densiflora* x *P. sylvestris*, *P. nigra* var. *austriaca* x *P. thunbergii* and *P. nigra* var. *austriaca* x *P. densiflora* were taller than non-hybrid seedlings from the same female parents. Whereas *P. thunbergii* and *P. densiflora* crossed easily with each other and some Chinese and Formosan species, crosses between *P. nigra* and *P. sylvestris* and crosses involving a European

and a Japanese species gave only a few hybrids; *P. resinosa* did not cross with any other species. There was no marked difference in cone set and set of empty seeds between fresh and one-year-old pollen but usually the set of filled seed was greater for the fresh pollen.

776 Bannister, M. H.
**Evidence of hybridization between *Pinus attenuata* and *P. radiata* in New Zealand.**
Trans. roy. Soc. NZ 1958 : **85** : 217–25.
Records of putative hybrids between the two above species occurring naturally in New Zealand are discussed and the performance of some of their progeny is briefly described [cf. 777]. These hybrids are compared with those reported from near Año Nuevo Point, Calif., USA, [XVI, 1424] and it is concluded that introgression of *P. attenuata* into *P. radiata* is taking place both in New Zealand and in California.

777 Bannister, M. H.
**Variation in samples of two-year-old *Pinus attenuata*, *P. radiata* and their hybrids.**
Trans. roy. Soc. NZ 1958 : **85** : 227–36.
"Samples of two-year-old *Pinus attenuata* and *P. radiata* displayed many morphological differences, particularly in stature, branching, development of buds, foliage and colour. Smaller, but still distinct, differences were noted between three samples of *P. attenuata* from widely separate places in California.
"$F_1$ hybrids between the species were intermediate in most characters. Seed collected from a single putative hybrid in Ashley Forest, Canterbury, gave rise to a strongly segregated hybrid swarm.
"Analysis by hybrid indices, using seven characters, effectively discriminated the two species, placed the $F_1$ hybrids half-way between the species, and suggested that the hybrid swarm was mainly the result of back-crossing to *P. radiata.*" [Author's summary].

778 Bourdeau, P. F. & Schopmeyer, C. S.
**The inheritance of exudation pressure and viscosity of resin in slash pine.**
Plant Physiol. 1958 : **33** : Suppl. xxxvi–xxxvii. (Abst.)
The rate of flow of resin from the ducts may be determined from a modification of the equation for capillary flow. One of the factors in the modified equation, viscosity of resin ($\eta$), was already known to be heritable in slash pine (*Pinus elliottii*). Another factor in the equation is the pressure under which resin is forced out of the tree after wounding. A method of measuring exudation pressure, $P$, was devised and used in demonstrating that this property is also under genetic control. $P$ and $\eta$ were inherited independently. In addition, the ratio $P/\eta$ was genetically determined. This ratio was correlated with the resin yields of the small trees used in the test. When employed as separate variables in a multiple-regression equation which also included their ratio, $P$ and $1/\eta$ were not significant. The ratio $P/\eta$ may be used to assess the resin-yielding ability of slash pine in progeny tests as soon as the trees reach a stem diameter of about 2 in.

779 Carlisle, A.
**A guide to the named variants of Scots pine (*Pinus silvestris* Linnaeus).**
Forestry 1958 : **31** : 203–24.
An annotated list is presented of 144 intraspecific taxa of the above species, arranged under geographical races, and habit, bark, timber, leaf, cone, male-inflorescence and seed variants.

780 Mirov, N. T.
***Pinus oaxacana*, a new species from Mexico.**
Madroño, S. Francisco 1958 : **14** : 145–50.
The above species was formerly regarded as a variety of *P. pseudostrobus*. It differs from the latter in having prominently projecting apophyses of the cone scales and in the turpentine containing considerable quantities of n-heptane and limonene in addition to the $\alpha$-pinene which accounts for over 90% of the turpentine of *P. pseudostrobus*.

781 Fowler, D. P. & Heimburger, C.
**The hybrid *Pinus peuce* Griseb. x *Pinus strobus* L.**
Silv. genet. 1958 : **7** : 81–86.
Using the hybrid index method of Anderson, an analysis was made of the foliage and stem characters distinguishing *P. peuce* and *P. strobus* from intermediate forms found at the Morgan Arboretum of Macdonald College, Canada. These latter pines had originated from a single *P. peuce* tree growing with *P. strobus* in Ottawa. The analysis indicated that the intermediate forms were probably true hybrids. The number of serrulations on the

inner edge of fully developed needle tips was found to be a good character for separating the two species from the intermediates and young seedlings and grafts could easily be classified with respect to the divergence of fully developed needles from the main branch. Several cone and seed characters were also of diagnostic value, the thickness of the seed coat being particularly useful. The $F_1$ hybrid of *P. peuce* x *P. strobus* is not of direct value for forestry purposes because it does not show hybrid vigour; in growth rate it is intermediate between the parents. Back crossing of the hybrids to *P. strobus* is suggested as a useful procedure for introducing resistance to *Cronartium ribicola* and *Pissodes strobi* into strains of *P. strobus*.

782 Nilsson, B.
Studier av 3-åriga avkommor efter korsning svensk gran x kontinentgran. (**Studies of 3-year-old progenies from the cross Swedish spruce x Continent spruce**).
Svenska SkogsvFören. Tidskr. 1958 : **56** : 225–50: also Årsberätt. För. Växtf. Skogstr. 1957 : 30–55.

Six mother trees of Swedish provenance were crossed in 1954 with eight other Swedish trees and eight Continent spruces and the two sets of offspring compared. Consistent differences in growth were observed between progenies of different mother trees as well as marked differences due to the pollen parents, most rapid growth occurring in progenies with Continent spruce as pollen parent. This result indicates that additive effects are more important than combining ability and suggests that good mother trees may be selected on the basis of relatively few progeny tests. The crosses with Continent spruce were almost equal to Swedish spruce in tolerance of autumn frosts and probably more tolerant of spring frosts. Comparisons of the Swedish x Continent spruce hybrids with Continent x Continent spruces from another series of experiments indicated that the former exceed the latter in growth, are superior or equal in hardiness towards autumn frost and probably equally tolerant of spring frosts. Correlations between growth and survival were strong and positive, between growth and frost damage positive, between flushing time and autumn frost damage positive, and between dry matter content of the leaves on the one hand and growth and frost damage on the other strong and negative. From a consideration of earlier work by the author [XXVIII, 951] and others, it is thought that the differences in growth among the progenies will be maintaind or increased up to or even beyond an age of 20–30 years. Preliminary studies showed a negative correlation between dry matter content in the mother tree and growth in the progeny.

783 Illies, Z. M.
Polysomatie im Meristem von Einzelbaumabsaaten bei *Picea abies*. (**Polysomaty in the meristem of progenies of individual trees of *P. abies***).
Silv. genet. 1958 : **7** : 94–97.

At the Institute for Forestry Genetics and Forest Plant Breeding at Schmalenbeck, abnormal seedlings were found amongst the progeny of single trees of *P. abies*. These seedlings had unusually short and thick shoots and needles; at the age of three years they resembled some 50-year-old dwarf spruces. Mixoploidy was found in the meristems of the abnormal seedlings and in the meristems of newly germinated embryos of similar parentage. On the other hand, the meristems (with one exception) were diploid in germinating seedlings originating from parent trees giving normal progenies. Eighteen of the 50-year-old dwarfs were investigated and six of these showed similar cytological abnormalities. The polysomaty observed is thus considered to be a pathological condition associated with abnormal growth; further investigations of this phenomenon will include crossing experiments involving mixoploid dwarf spruces and normal forms.

784 Kiellander, C. L.
Hybridlärk och lärkhybrider. (**Hybrid larch and larch hybrids**).
Årsberätt. För. Växtf. Skogstr. 1957 : 56–83.

This survey begins with a list of the characters which make larch particularly suitable as breeding material; these include its variability, rapid growth and good compatibility in interspecific crosses. There follow accounts of the systematics of the genus and of the history of the hybrid larch, *Larix eurolepis*, in Sweden and other European countries. Experience in most places has shown that the hybrid larch exceeds both parents in growth and in addition is resistant to *Dasyscypha willkommii*. In a Swedish experiment, tree survival as well as growth in nine-year-old stands of hybrid larch was better than in corresponding stands of European larches of varying provenance or Japanese larches with the same pollen parent as the hybrids. Useful characters associated

with the rapid growth of hybrid larch are its greater competitive ability and the shorter time needed in the nursery. The suitability of different larch species and hybrids for the different climatic zones in Sweden distinguished by the Swedish Pomological Association is discussed, *L. eurolepis* being recommended for the milder areas, *L. sibirolepis* for a less mild climate and *L. eurosibirica* for severer conditions. It is suggested that *L. sibirolepis* may prove superior to *L. eurolepis* even in the mildest zones. The paper concludes with a discussion of hybrid seed production and the possibilities of setting up large-scale seed orchards. Self-sterile plus trees are required as mother trees.

785 Asada, S.
**(Studies on the dormant period of *Larix*).**
J. Fac. Agric. Shinshu Univ. 1958 : No. 8 : 1–20. [Japanese].

Data on the date of inception and duration of the dormant period following terminal bud formation are provided for a series of varieties of *L. kaempferi* and representatives of *L. europaea, L. dahurica, L. kurilensis* and an unidentified species.

786 Owen, H. E. (Jun.)
**Racial variation in seedling development of Douglas fir, *Pseudotsuga menziesii* (Mirb.) Franco.**
Diss. Abstr. 1958 : **18** : Publ. No. 24,648 : 35–36. (Abst.)

Information is provided on racial disparities shown in seedling development by samples of *Pseudotsuga menziesii* from Oregon, Washington, Montana and Colorado when subjected to different photoperiods and various other conditions.

## VEGETABLES

787 Mil'čin, M. I.
**(Varietal trials of vegetable crops in frames).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 7 : 18-19. [Russian].

**Cauliflower.** Moskovskaja Konservnaja [Moscow Preserving] and Otečestvennaja [Fatherland] are mentioned for high yields at Ljubercy, Moscow province. The former ripens early and the latter forms fine heads.

**Lettuce.** Majskij [May] was as early as Moscovskij Parnikovyj [Moscow Frame] but more productive.

**Cucumber.** Novočerkassk 385 had larger fruit and was of superior quality to Nerosimyj 40 [Rainfed 40] and its yield, especially of high-grade fruits, was higher.

788 **New vegetable varieties. List V.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 591–600.

A further descriptive list is given of varieties of vegetables introduced into North America since 1936 by official institutions, trade organizations and private individuals [cf. XXVIII, 968].

789 Lamm, R., Hintze, S. & Åvall, H.
Klassificerande sort- och stamförsök med köksväxter 1955–1957. **(Classificatory trials of varieties and strains of vegetables, 1955-1957).**
Medd. Trädgårdsförs. 1958 : No. 110 : Pp. 39.

This descriptive list of all the varieties and strains awarded first class rank in the above trials, carried out at Alnarp and other stations in Sweden, includes the new varieties mentioned below.

**Leek.** Regius OJO/57, from S:t Jörgen [St. George] x Special, is a good cropper, especially in late autumn or early winter.

***Brassica.*** The cauliflower Brio OE/57 (Codania x Lucullus) is early, productive and good in quality.

Sapidus OJO/57, a new Brussels sprout from Sanda x marrow stem kale, is not early but gives a high proportion of top-quality sprouts.

**Spinach.** Karat OE/57 (Herkules x Cavallius jätte [Cavallius Giant]) has erect leaves, is earlier and higher in yield than Gaudry vinter W:s/52 [Gaudry Winter W:s/52] and equals this variety in resistance to downy mildew.

**Lettuce.** Urania/57 has already been described [XXVIII, 2639].

**Cucumber.** Arla W:s/57, previously known as Weibulls $F_1$ [cf. XXVII, 2374], and Final OJO/57 are both very early, high-yielding hybrid cucumbers for forcing. The first is a triple hybrid. The parents of the second are a cross between two older greenhouse varieties and a cross between a forcing and an open-air cucumber.

***Phaseolus.*** The green-podded dwarf beans Delikat/57 [Delicious/57] and Rika/57 are both high in quality, the former midearly and not very high in yield but resistant to anthracnose and the latter as early as Konserva but more productive. Delikat comes from the cross

Hundra för en [Hundred for One] x Konserva and Rika from Konserva x Rekord.

790 Evdokimov, M. N.
**(New standard varieties of vegetable crops).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 20–22. [Russian].

**Cabbage.** Krasnodar 1 and Taškent 10 are midseason types resistant to heat and drought and form good heads. They outyield the previous standards for Krasnodar and Uzbekistan respectively.

**Cauliflower.** Urožajnaja [Productive] is highly productive of firm heads with good consistency and flavour. It is referred to as a late-midseason variety.

**Cucumber.** Among new high yielding varieties with fruit of high grade, Vladivostok 155 is mentioned for resistance to *Colletotrichum* and *Pseudoperonospora* and Altajskij Rannij [Early Altaj], Mnogoplodnyj [Many-fruited] and Leningradskij Tepličnyj [Leningrad Hothouse] x Klinskij Mestnyj [Local Klinskij] for early maturity.

**Tomato.** Šatilovo 35, Don 202, Hybrid 86, Podarok 105 [Gift 105], Budennyj 5, Soviet 679, Krasnodarec 87/23–9 [tomato from Krasnodar 87/23–9], Tiraspol' 125 and Argavand are all more productive than the previous standards for various Soviet territories. Šatilovo 35 and Don 202 ripen early and Budennyj 5, Soviet 679 and Tiraspol' 125 have large fruit.

791 Braak, J. P. & Kho, Y. O.
**Some observations on the floral biology of the carrot (*Daucus carota* L.).**
Euphytica, Wageningen 1958 : **7** : 131–39.

Investigations at the Institute of Horticultural Plant Breeding, Wageningen, Netherlands, have shown that production of ♂ flowers, ♂ sterility and the apparent inability of some ovaries to develop even in the absence of attack by *Lygus campestris* may have an adverse effect on seed production. From observations on wild Dutch carrot, Amsterdam Forcing and Flakkeese, it was found that the percentage of ♂ flowers was practically negligible in the main umbel but increased regularly in umbels of higher order. The three types differed significantly in percentage of ♂ flowers per plant; the tendency to produce ♂ flowers is probably determined mainly by the genotype. Male-sterile plants were encountered in the wild carrot and Amsterdam Forcing. The stamen filaments remained unrolled and the anthers failed to dehisce. This ♂ sterility may prove useful in the production of hybrid varieties.

792 Dickson, M. H. & Peterson, C. E.
**Hastening greenhouse seed production for carrot breeding.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 412–15.

The results of experiments at Michigan State University suggested that, for the most rapid and uniform seed production after harvesting in autumn, the roots should be stored for 10 weeks at about 40° F. and then allowed to grow at 55° F. until seed stalks appear, after which the temperature should be raised to 70–80° F. to hasten anthesis and seed maturity.

793 Hagiya, K.
**(Studies on the occurrence of pithy tissue in root crops. V. The occurrence of pithy tissue in the $F_1$ and $F_2$ of intervarietal radish crosses and considerations concerning the breeding of resistant varieties).**
Engei Gakkai Zasshi/J. hort. Ass. Japan 1958 : **27** : 68–77. [Japanese].

The genetics of pithy roots was studied in the $F_1$–$F_2$ of 20 hybrids involving 7 varieties. The $F_1$ was usually intermediate between the parents in respect of pithiness; in the $F_2$ wide segregation occurred. Pithiness is positively correlated with the cell size of the xylem parenchyma and negatively with soluble dry-matter content of the root and with starch content. Pithiness is not correlated with root weight or leaf/root ratio. Some instances of heterosis in the $F_1$ were observed in respect of such characters as leaf production and, less often, root weight; pithiness was not affected by hybrid vigour. The varieties Eichin and Tokinashi, which have a high assimilatory rate, are recommended in breeding for resistance to pithiness.

794 Ustimenko, G. V.
**(Seed production of the Jerusalem artichoke in the central districts of the Nonchernozem Belt).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 30–35. [Russian].

Data on overwintering of the tubers in the ground and the yield of green matter and tubers for a few varieties tested in the province of Moscow in 1956 and 1957 are presented. Saratov was the most productive of green matter among varieties that overwintered well, and in tuber yield it was just below Belaja Urožajnaja

[White Productive] and appreciably below that of Hybrid 120 in 1956 [cf. XXVII, 2335].

795 Küppers-Sonnenberg, G. A.
Auslese- und Kreuzungszucht an der Topinambur seit dem zweiten Weltkriege. (**Selection and cross breeding in Jerusalem artichoke since the second world war**).
Angew. Bot. 1958 : **32** : 52–67.

The following breeding results obtained at the Sonnenberg breeding station, Germany, are mentioned.

Type of stolon formation has been found to be a varietal character but is also partly dependent on nutritional conditions. In the hot, dry summer of 1947, *Helianthus doronicoides* 'Sonnling' and *H. macrophyllus* 'Spindel' were particularly resistant to drought.

Crosses of *H. annuus* (♀) with *H. doronicoides* resulted in two plants, designated *H. andoris* I and II. The flowers of II were intermediate in size between the parental types, and the leaves were intermediate in form. From six hybrid tubers retained, a series of different forms ranging between extreme matrocliny and extreme patrocliny were obtained. Matroclinous forms kept for further breeding were fertile.

The French strain D/19 flowers early, is fertile and has given rise to the selection Bianka-Allerfrüheste [Bianka Earliest of All], which in turn has been used as parent in breeding Blandine, Blandite and Blandetta and the Bias lines Fontane and Maxime. Bianka shows much segregation in form among the progeny from selfing.

796 Corrales M., A.
Comparativo de variedades de cebollas. (**Comparison of onion varieties**).
Inf. mens. Estac. exp. agríc. La Molina 1958 : **32** : No. 369 : 19–26. (Mimeographed).

Data are given on the performance of 15 varieties introduced from the USA. Several equalled the local varieties in adaptation and were good in quality. White varieties appeared to be more susceptible to mechanical damage during harvesting than coloured varieties.

797 Franklin, D. F.
**Effects on hybrid onion seed production of using different ratios of male-sterile and pollen rows.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 435–39.

The following two experiments were carried out in plots in commercial seed fields in Idaho. (1) A block of 16 consecutive rows of ♂-sterile parents was flanked on one side by 4 rows and on the other by 2 rows of the pollen parent. In the remainder of the 5-acre field, 8 ♂-sterile rows alternated with 2 rows of the pollen parent. (2) Twenty-four ♂-sterile rows were flanked on each side by a single row of ♂-fertile plants. The remainder of the 20-acre field was planted in an 8 : 2 ratio. In (1) and (2) the rows were respectively 540 and 240 ft. long, the distance between the rows being 3 ft. The inbreds used were those making up the hybrid Autumn Spice. They naturally coincide closely in flowering period and the ♂ parent is notable for its abundant production of pollen. The results suggested that a higher planting ratio than those currently used may be employed but the need for caution in applying the results to the seed production of other hybrids is stressed.

798 Srinivasachar, D. & Patau, K.
**Reductional groupings in cold-treated onion roots.**
Chromosoma 1958 : **9** : 229–37.

The frequency of metaphase and anaphase reductional groupings was lower in roots which had been kept for 10 days at 5–6° C. than in roots which had been kept at 21–22° C.; the frequency of reductional groupings at prophase was higher in the cold treated roots. It was also found that considerable variation occurs in the frequencies of metaphase and anaphase reductional groupings in roots which are kept at an approximately constant temperature; the frequency of reductional groupings may therefore undergo changes independent of the temperature. The probability of a mitosis of the reductional type producing a haploid cell with a complete genome was calculated to be less than $10^{-5}$.

799 Perkins, D. Y., Kehr, A. E., Brown, R. T., Tims, E. C. & Miller, J. C.
**Delta Giant, a new long season shallot.**
Circ. La. agric. Exp. Sta. 1958 : No. 52 : unpaginated.

Delta Giant, also known as seedling A–57 and Summer Shallot, has been released by the Louisiana Agricultural Experiment Station. It was derived from a cross between *Allium fistulosum* and *A. ascalonicum*; after colchicine treatment a back cross was made to *A. ascalonicum*. This variety combines the vigorous growth, dark green leaf colour and large root system of *A. fistulosum* with the more divided habit of the shallot. It is longer than other

shallots and at maximum growth may produce twice the yield of varieties such as Bayou Pearl. Delta Giant may be planted earlier in the autumn and later in the spring than other varieties; it grows well under unfavourable conditions of temperature and moisture. This variety has shown some resistance to leaf spot and die back and considerable resistance to pink root, its susceptibility to aster yellows being apparently less than that of other varieties. Since individual stems of a bunch are larger and fewer in number than those of other varieties, there is less cleaning required per unit of weight. The stems are tender and succulent; the best quality is obtained when the shallots are harvested before they are fully grown.

800 HWANG, S. L.
**A comparison of certain asparagus varieties and strains for spear weight, yield and quality.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 425–27.

The following varieties and strains were evaluated in a trial at the University of Minnesota: Faribo $F_1$, KBF, Paradise, Mary Washington, Calif. 499 and 500, Eden, 4–5 x 3–9 and (4–5 x 3–9) x (5–21 x 5–2).

801 MITSUKURI, Y.
**(Chromosome studies on *Brassica* in our country. II. Chromosome numbers and caryotypes of cultivated species).**
Nihon Diagaku Nojuigakubu Gakujutsu Kenkyu Hokoku/Bull. Coll. Agric. Vet. Sci. Nihon Univ. 1956 : No. 5 : 21–34. [Japanese].

Caryotypes have been determined for selected varieties of *B. napus* ($2n = 38$), *B. cernua* (36), *B. chinensis* (20), *B. parachinensis* (20), *B. rapa* (20) and *B. alboglabra* (18). The caryotype of *B. napus* indicates its hybrid origin from *B. oleracea* x *B. chinensis*. Japanese varieties of this species had larger chromosomes than European introductions. *B. cernua* differed markedly from the other species in chromosome morphology. *B. parachinensis* is closely related caryotypically to *B. chinensis* and *B. alboglabra* is probably connected with *B. oleracea*. [Cf. XXIV, 3100].

802 COLHOUN, J.
**Club root disease of crucifers caused by *Plasmodiophora brassicae* Woron.**
Phytopath. Pap. Commonw. myc. Inst. 1958 : No. 3 : Pp. 108.

In the section entitled Varietal reaction of cultivated hosts to infection, studies of cultivated *Brassica* species and hybrids are reviewed and resistant and susceptible varieties listed. Further brief reviews of published work are presented in Physiologic specialization of the parasite and The nature of host resistance.

803 SHIBATA, K.
**(The relation between direct and reciprocal $4x$ x $2x$ crossings of *Brassica pekinensis* and the oppositional genotypes).**
Nogyo Shuho/J. agric. Sci., Tokyo 1957 : **3** : 273–80. [Japanese].

Fertility in crosses of the types $S_aS_aS_aS_a$ x $S_aS_a$, $S_aS_aS_bS_b$ x $S_aS_a$, $S_aS_aS_aS_a$ x $S_bS_b$, $S_aS_aS_bS_b$ x $S_cS_c$ and the reciprocals was investigated. Percentage capsule set was much higher in compatible crosses (no alleles common to the two parents). Seed fertility did not differ appreciably in the $F_1$ of compatible and incompatible combinations. Occasional $2x$, $3x$–1 and $4x$ $F_1$ plants were noted amongst the expected $3x$ progeny.

804 POPOVA, E. M.
**(Hybrid seed of cabbage).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 10–13. [Russian].

Breeding hybrid varieties by means of open pollination at Gribovo is discussed. Among the results are the following heterotic hybrids: Nomer Pervyj 147 [Number One 147], open pollinated by Val'vat'evka 145, gives 87% of hybrid seed and the yield increase amounts to 45–70%; the $F_1$ and $F_2$ of Nomer Pervyj 147 x Zolotoj Gektar 1342 [Golden Hectare 1342] are earlier than the early parent and show heterosis for yield; and direct and reciprocal $F_1$ and $F_2$ hybrids of Amager 611 x Zimovka 1474 [Overwintering 1474] outyielded the parents by 12–46%, without showing an impairment of their keeping properties.

805 NAKAGAWA, H., KAMIMURA, S. & SATO, I.
**(Studies on the ecological characters of *Brassica pekinensis* varieties. I. The relation between changes in the date of spring sowing and characters of principal importance).**
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1957 : No. 11 : 59–73. [Japanese].

Information is provided on the date of flower-bud differentiation, bolting time, percentage heading and seed production of a series of Japanese varieties sown at various dates from March to May.

806 Nakagawa, H. & Henmi [Hemmi], S.
**(Studies on the effect of low-temperature treatment on the production of seed of *Brassica pekinensis* in the autumn. II. The relation between the type of low-temperature treatment and autumnal seed production in some of the more important varieties).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 6–12. [Japanese].
Further to the investigation reported previously [XXV, 3475], five varieties were subjected to low-temperature for 15 or 30 days, after 10, 30 or 70 days from sowing, to promote bolting. Data are provided on the date of flower-bud differentiation, flowering and seed production for the five varieties. The variety Aichi was irresponsive to the treatments and did not produce seed in autumn.

807 Nieuwhof, M.
**Vegetative maintenance and propagation of cauliflower.**
Euphytica, Wageningen 1958 : **7** : 170–78.
The results of experiments carried out at the Institute of Horticultural Plant Breeding, Wageningen, Netherlands, to study techniques of vegetative propagation are surveyed. Propagation from root-shoot cuttings proved to be the most efficient method and is considered to be promising for use by breeders.

808 Sampson, D. R.
**Inheritance of persistent sepals in green sprouting broccoli.**
Canad. J. Pl. Sci. 1958 : **38** : 8–11.
Persistent sepals in Calabrese green sprouting broccoli sometimes occur and segregation data indicate that this is due to a single gene *ps* which is incompletely recessive and is linked with the $S_4$ gene for self incompatibility.

809 Buishand, T.
Teelt en veredeling van spruitkool. **(The culture and breeding of Brussels sprouts).**
Med. Proefsta. Groenteteelt volle Grond 1958 : No. 10 : Pp. 55.
In trials conducted at different stations in 1955–57, a selection from Jos Huizer did well at most stations. Since the crop is cross-pollinated, however, many strains have been developed and the performance of these varies in different localities. In breeding, the association frequently observed between early, high yields and coarse, loose sprouts and between late, lower yields and fine, compact sprouts needs to be broken and strains resistant to *Mycosphaerella brassicicola* developed. Breeding methods used are: (1) mass selection; (2) family selection; and (3) parental selection. In the latter method, which offers the best opportunity for maintaining varietal purity, parent plants selected on the basis of the performance of their progeny are vegetatively propagated so that they may be used in subsequent years. The selected parents may also be inbred to give lines suitable for the production of $F_1$ hybrids, but inbreeding involves such difficulties as inbreeding depression and the automatic selection of self compatible plants. Vegetative propagation may be effected by means of root cuttings or detached sprouts may be rooted in January. Plants from the former remain vegetative and produce sprouts while those from the latter flower unless the buds are removed as they appear. If prevented from flowering, the sprout cuttings develop side shoots which may be removed and rooted as new cuttings; these then produce sprouts and do not flower until the following year.

810 Sneep, J.
**The breeding of hybrid varieties and the production of hybrid seed in spinach.**
Euphytica, Wageningen 1958 : **7** : 119–22.
The aims of producing $F_1$ hybrids of spinach are defined as follows: (1) exploitation of heterosis and transgression, (2) combination of desirable characters which are governed by dominant genes, as in the case of resistance to *Peronospora spinaciae* or mosaic (*Cucumis* virus 1); and trade protection of the breeder's product since others will not wish to grow the later generations. A theoretical plan based on the mode of sex inheritance postulated by Bemis and Wilson [cf. XXIV, 1494] is outlined as a means of securing an entirely ♀ mother variety. Practical realization of the procedure is however hampered by the difficulty of identifying certain sex genotypes phenotypically. Finally, it is suggested that use of a round-seeded ♀ parent and prickly-seeded ♂ parent would have advantages in the commercial production of $F_1$ hybrid seed.

811 Zink, F. W. & Smith, P. G.
**Brief notes on plant disease occurrence. A second physiologic race of spinach downy mildew.**
Plant. Dis. Reptr. 1958 : **42** : p. 818.
Varieties and breeding stocks immune from

*Peronospora effusa* have been developed by incorporating the dominant gene for immunity found in PI140467 from Iran [cf. XX, 1208]. A second race causing breakdown of the immunity has appeared in California. A search for resistance to this race has been initiated. USDA line 99 x 95 may be resistant.

812 **Three new head lettuces.**
Agric. Res., Wash. 1958 : **7** : No. 1 : p. 15.

Three new lettuce varieties, Golden State A, Golden State B and Lakeland, all originating from the US Department of Agriculture Research Center at Beltsville, Md., are now available. The Golden State varieties, developed in cooperation with the California Agricultural Experiment Station, are large, dark green, slow bolting and resistant to tip burn; in maturity date, they resemble popular strains of Great Lakes. Lakeland was developed in cooperation with the Wisconsin Agricultural Experiment Station; it is medium-sized, particularly slow to bolt and resistant to tip burn and rib discoloration. These three varieties are crisp and of good eating quality.

813 Kishi, K.
**(Studies on *Glomerella lagenaria*. II. Characteristics of *G. lagenaria* isolates from a number of cucurbits).**
Tokai Kinki Nogyo Shikenjo Engeibu Kenkyu Hokoku/Bull. Hort. Div. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 99–112. [Japanese].

Thirty-one isolates from species of *Benincasa*, *Cucumis*, *Citrullus* and *Lagenaria* were studied. Cross-inoculation tests revealed little evidence of pathogenic specialization. However, the strains differed in conidial size and in sensitivity to such fungicides as copper sulphate and dithane Z–78.

814 Kopilovič, O. I.
**(Local varieties of cucurbits).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 39–41. [Russian].

The melon Dubovka Grubnenskaja was selected from local material in the Černovcy province of the Ukraine. It ripens 10 days earlier than the standard variety Kolhoznica Udlinennaja [Long Kolhoznica] and outyields it by 18%. Other varieties include the water melon Grubnenskij and the pumpkin Starosel'skaja. The former is a population comprising eight local varieties and is characterized by moderate requirements of moisture and warmth. The pumpkin is earlier and more productive than the standard variety Mozoleevskaja 15.

815 Švorneva, A. M.
**(Diseases of cucurbitaceous plants).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 7 : 32–35. [Russian].

The melon Kolhoznica [Collective Farmer] and water melon Birjučij Kut 823 showed a higher degree of resistance to *Colletotrichum lagenarium* (*Glomerella lagenaria*) than other varieties at Bykovo, and the water melons Pobeditel' 395 [Conqueror 395], Volga 7, Belosemjačko 187 [White-seeded 187] and Bykovo 22 were highly resistant to *Fusarium niveum*. The pumpkins Mozoleevskaja, Perehvatka [Girdle], Belaja 3 [White 3] and Medovaja Belaja 611 [Honey White 611] are mentioned for immunity to bacterial leaf spot.

816 Mohov, V.
**(Cucurbitaceous crops in the province of Karaganda).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 8 : 30–32. [Russian].

Water melons and melons from the Karaganda Agricultural Research Station are characterized by earliness and good flavour, and a pumpkin is mentioned for its high yield and good keeping properties.

817 Konsler, T. R. & Barham, W. S.
**The inheritance of seed size in watermelon.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 480–84.

The seed size of NC9–2, averaging 7·4 mm., was monogenically determined and dominant to seed size in Charleston Gray, averaging 12·7 mm. On the basis of the data obtained by the authors and Pool *et al.*, [XII, 611], it is suggested that varieties ranging in average seed size from 7·4 to 10 mm. should be placed in a genotypic class for medium size.

818 Skripnikov, Ju. G.
**(An interesting instance of prolificacy in the pumpkin).**
Priroda (Nature), Leningrad 1958 : No. 5 : p. 113. [Russian].

Mention is made of an unusually productive specimen of hybrid 77 of *Cucurbita maxima* from Mičurinsk, which is thought to possess breeding value. It produced 13 fruits, 11 of which reached maturity; other plants of this hybrid bore 5–6 fruits and fewer fruits.

819 HAYASE, H.
**(Studies on *Cucurbita* crosses. XII. Anther dehiscence and the fertilizing capacity of the pollen).**
Ikushugaku Zasshi/Jap. J. Breeding 1958 : **8** : 28–36. [Japanese].
Anther dehiscence can be accelerated by high-temperature treatment of the buds for two days before anthesis or by slitting the anther walls at noon of the day preceding anthesis. Fertilization capacity of the pollen is poor in the first case but good in the second. [Cf. XXVII, 4561].

820 WINSTEAD, N. N. & BARHAM, W. S.
**Progress made in controlling scab on squash.**
Res. & Fmg. 1958 : **17** : No. 1 : p. 13.
Crosses have been made between four selections carrying resistance to *Cladosporium cucumerinum* and two susceptible commercial varieties commonly grown in North Carolina.

821 NAGAEVA, N. P.
**(Pumpkin varieties with a bush habit).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 5 : 32–33. [Russian].
Pena 766 [Froth 766] and Pobeda 124 [Victory 124] were obtained from a cross of the egg plant Gribovo with the pumpkin Mozoleevskaja 49 at the Verhnjaja Hava Horticultural Research Station. They are early, drought resistant bush types and outyield ordinary varieties by 150 c. per ha. or more.

**Annual report of the Glasshouse Crops Research Institute, Littlehampton, Sussex, 1956** : Pp. 140.

822 *Darby, L. A. IV. Plant breeding. (pp. 106–09).*
$F_1$ hybrids between commercial varieties of cucumber and 25 genotypes of tomato were tested for yield and market grade. The trials were mainly concerned with the introduction of better experimental techniques.

823 SMIRNOV, N. A.
**(The culture of early vegetables).**
Priroda (Nature), Leningrad 1958 : No. 8 : 97–100. [Russian].
Several heterotic hybrids of cucumber bred at the Marfino Vegetable Association, Moscow, are mentioned. The most productive is Leningradskij Tepličnyj [Leningrad Hothouse] x Kitajskij Mnogoplodnyj [Chinese Many-fruited].

824 **Green Spot, a hybrid cucumber resistant to gummosis.**
Bruinsma Bull. 1958 : No. 4 : 1–2.
This new variety from the Bruinsma Hybrid Seed Co., Netherlands, is suitable for hothouse cultivation and combines resistance to gummosis with high yields. It grows rapidly, doing well with minimum night temperatures of 60° F., and is earlier than Butcher's.
Mention is also made of Green Stick, a gummosis-resistant Telegraph type for cultivation under frames.

825 BARHAM, W. S. & WINSTEAD, N. N.
**New cucumbers stop scab and mildew.**
Res. & Fmg. 1958 : **17** : No. 1 : p. 6.
The two varieties described here are both resistant to *Pseudoperonospora cubensis*, *Cladosporium cucumerinum* and give good yields. Fletcher was developed from a cross between Stono and Highmoor and produces fruits similar to those of Stono. Ashe derives from a cross between Highmoor and Ashley and its fruits are almost identical with those of Ashley. They were developed by the North Carolina Agricultural Experiment Station, Raleigh, N.C.

826 ALEKSANDROV, S. V.
**(The cucumber variety Leningradskij Tepličnyj 23).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 35–36. [Russian].
Leningradskij Tepličnyj 23 [Leningrad Hothouse 23] was selected from Datskij Pikul'nyj [Danish Pickling]. It produces high quality fruit and the yield of 27 kg. per m.² exceeds that of Klinskij by 30%. It is a useful component for producing heterotic offspring. Direct and reciprocal hybrids with Klinskij, for instance, outyielded the latter variety by 11 kg. per m.² The hybrid varieties also show improvements in earliness, fruit quality and flavour.

827 AALDERS, L. E.
**Monoploidy in cucumbers.**
Diss. Abstr. 1957 : **17** : Publ. No. 24,050 : p. 2775. (Abst.).
Embryos from seeds which floated in water were cultured as material including possible monoploids. The 13 monoploids identified were inferior in vigour to the most vigorous diploids embryo-cultured from floating seeds, but were equal to or slightly better than the least vigorous diploids. They produced only a few ♂ flowers, these having nondehiscent anthers without pollen. In a number of ♀ flowers, the monoploids resembled diploids. It is suggested

that, as in maize, the monoploid technique offers possibilities as a method of obtaining homozygous lines.

828 Ito, M. & Saito, T.
**(Studies on the conditions controlling the differentiation of female, male and hermaphrodite cucumber flowers. IX. Studies on the effect of the amount of nitrogen applied and the amount of watering under various photoperiodic and night-temperature conditions at the seedling stage).**
Engei Gakkai Zasshi/J. hort. Ass. Japan 1958 : **27** : 11–20. [Japanese].
Female-flower production was promoted by low nitrogen level and heavy watering [cf. XXVIII, 4831].

829 Knyš, A. N.
**(The cross pollination of cucumber varieties in connexion with spatial isolation and pollen viability).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 13–16. [Russian].
A distance of 500–1000 m. between two varieties was sufficient to maintain them in a pure state in the Ukrainian woody steppe even if both varieties were visited by bees. The pollen carried by a bee over distances exceeding 500 m. became inviable.

830 Knyš, A. N.
**(Pollen viability of cucumber plants).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 66–68. [Russian].
Controlled experiments on intravarietal pollination of Nežin 12 and observations on pollen growth under laboratory conditions at Dnepropetrovsk showed that the most viable pollen was that taken from the flowers on the day of anthesis. Pollen growth was best at a temperature of 20–25° C. with air humidity 80–100%.

831 Busch, L. V. & Walker, J. C.
**Studies of cucumber anthracnose.**
Phytopathology 1958 : **48** : 302–04.
The mode of inheritance of the seedling resistance to *Colletotrichum lagenarium* (*Glomerella lagenaria*) shown by three accessions of cucumber was investigated. Resistance in PI175111 depended upon a single dominant gene. More than one pair of genes, or one pair of major genes together with modifiers, appeared to determine resistance in PI163213. In PI163217 resistance was multigenic. Penetration of the leaves by the fungus was similar in resistant and susceptible plants, but in the former the cytoplasm and chloroplasts disintegrated more slowly and, in cells in advance of the hyphae, the walls thickened and red-staining deposits were formed in the intercellular spaces.

832 Bonvicini, M.
Prospettive per il miglioramento genetico del pomodoro. **(Prospects for the genetic improvement of the tomato).**
Convegno per il Miglioramento e la Difesa sanitaria del Pomodoro, Parma, 29 sett. 1957 : Pp. 12.
Yields of over 1000 c. of fruit per ha. from tomatoes such as Prospero and Pirro, produced by the speaker, when grown in the open at Parma are quoted in this lecture in demonstration of the effective use of established breeding methods for tomatoes in Italy. Newer techniques such as chromosome duplication and induced mutation have so far contributed little or nothing to the practical improvement of the tomato. The results from $F_1$ hybrid seed have been often doubtful and sometimes negative but further experimentation in this direction is recommended.
Reference is made to efforts made at the plant breeding institute at Bologna to combine high yield with lower acidity and other features associated with high fruit quality, and with resistance to *Phytophthora* and other diseases.

833 Tomes, M. L. & Quackenbush, F. W.
**Caro-Red, a new provitamin A rich tomato.**
Econ. Bot. 1958 : **12** : 256–60.
Developed at Purdue University Agricultural Experiment Station, Indiana, Caro-Red bears fruits with about ten times the provitamin A content of Rutgers. Externally orange in colour, the fruits have orange-red flesh. In yield, Caro-Red is comparable with Rutgers and other named varieties. Its complex pedigree involves *Lycopersicon hirsutum*, Indiana Baltimore and Rutgers. It is expected that initially the variety will be used chiefly for the domestic garden.

834 Pollack, B. L.
**New early $F_1$ hybrid tomato developed for fresh market.**
Sci. Fmr., Pa. 1958 : **5** : No. 4 : p. 4.
A hybrid known as Pa–103 $F_1$ (Pritchard x S27–48) has shown promise with respect to yield, fruit size, resistance to cracking, earliness, disease resistance, uniformity and appearance in Pennsylvania. It ripens at the same time as Valiant and Stokesdale.

835 KUJAT, F. F.
**(Orange tomatoes).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : p. 75. [Russian].

The yellow-fruited tomato Altajskij Mestnyj [Local Altaj] bore a fruit with a red stripe. The plants raised from seed taken from the red portion of the fruit had orange fruit. One of these plants had three cotyledons and produced larger fruits of better flavour than the mother variety. An editorial footnote explains the phenomenon as a case of mixed inheritance.

836 ŠUMANSKAJA, M. G.
**(Vegetative hybrids arising from callus).**
Agrobiologija (Agrobiology) 1958 : No. 1 : 67–75. [Russian].

Experiments on graft hybridization of tomatoes at Gorki Leninskie showed that shoots arising from callus were of hybrid nature and gave rise to hybrid progenies. The hybrids differed from the stock and scion varieties with regard to the shape of leaf, inflorescence and fruit, number of locules and fruit colour. The changes were heritable but unstable, as most $F_3$ hybrids continued segregating. For instance, the $F_3$ of Zolotaja Koroleva [Golden Queen]/Mexican 353 from the Institute of Plant Industry segregated for fruit colour and earliness.

837 KRAEVOJ, S. JA.
**(Experiments on grafting nontuberiferous Solanaceae).**
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel. biol. (Biol. Ser.) 1958 : **63** : No. 2 : 107–22. [Russian].

Experiments on grafting tomatoes, differing with regard to fruit colour, showed that no changes in the graft generation occurred and that the $F_1$ and $F_2$ gave no segregates in respect of fruit colour. Changes in chemical properties were observed in grafts in both directions between tomato and *Datura*, and tomato and *Nicotiana tabacum*. The acquired changes were not transmitted to the first seed generation and the second seed generation did not segregate.

838 AVALJAN, L. M.
**(Combined vegetative and sexual hybrids of the tomato).**
Izv. Akad. Nauk Armen. SSR : Biol. sel'sk.-hozjajstv. Nauk (News Acad. Sci. Armen. SSR : Biol. agric. Sci.) 1957 : **10** : No. 2 : 47–56. [from Ref. Ž. (Ref. J.) 1957 : No. 22 : p. 31.] [Russian].

An account of Armenian experiments with tomatoes, referring to observations on changes in dominance and mode of segregation as a result of combined vegetative and sexual hybridization, is presented.

839 MAKSAKOVA, V. M.
**(Improvements of valuable biological and economic characters in tomatoes).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 16–20. [Russian].

Training the $F_1$ of such hybrids as Štambovyj Karlik 1185 [Bush Dwarf 1185] x Alisa 639 upon soil rich in potash and phosphorus improved the productiveness, earliness and hardiness of their progeny under Moscow conditions.

840 SOLTANOVSKAJA, G. A.
**(The new tomato variety Soviet 679).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : p. 73. [Russian].

It was bred from Bison x Pritchard at the Simferopol' Horticultural Research Station and has a growth period of 125–130 days and yields 221·6–508 c. per ha. in the open, including 54–76 c. first fruits gathered 16 days earlier than the main crop. The fruits are large, and rich in dry matter, sugar and vitamin C and their flavour is good.

841 ARTEMENKO, J. I.
**(The tomato variety Peremoga 165).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : p. 36. [Russian].

Peremoga 165 (Opolčenec [Serviceman] x Gruntovyj Alpat'eva [Alpat'ev's Outdoor]) ripens at the same time as Bison but is more productive. It yields 34·7% marketable fruit. It is tolerant of low temperatures and resistant to diseases. The fruit is large and firm-skinned and its flavour is good.

842 **Pinkshipper tomato.**
Agric. Res., Wash. 1958 : **7** : No. 11 : p. 16.

Ripening at the same time as Marglobe, Pinkshipper [(Gulf State Market x Pan American) x (Marvelosa x Marglobe)] is a pink-fleshed, wilt-resistant variety suitable for the fresh market and greenhouse or outdoor cultivation.

843 LINEV, P. S.
**(The new tomato variety VSHI21).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 6 : 33–34. [Russian].

VSHI21 [Higher Agricultural Institute 21] was obtained at the Luganskoe Agricultural Institute by selection and intravarietal hybridization

of an unspecified form. It is as early as Majak [Lighthouse] and its yield is appreciably higher. It produces large fruits which retain good flavour even when picking is delayed. It transports well.

844 VAN DESSEL, M.
10 jaar rassenonderzoek bij tomaten. **(Ten years of varietal trials of tomatoes).**
Tuinbouwber., Leuven 1958 : **22** : 146–48.

Based on the results of varietal trials, notes are given on the origin, characteristics and suitability for cultivation in Belgium of six English, nine Netherlands, one German, four American and six Belgian varieties.

845 IPAT'EV, A. N.
**(Horticulture at the White Russian Agricultural Academy).**
Trud. Belorussk. sel'skohozjajstv. Akad. (Trans. White Russ. agric. Acad.) 1957 : **26** : No. 2 : 117–20. [Russian].

Mention is made of new varieties of fruit trees and vegetables bred at Gorki, among them of an unnamed tomato characterized by uniform maturation.

846 KONONKOV, P. F.
**(The role of the pollen of the maternal variety in intervarietal crossing of tomatoes).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 1 : 16–19. [Russian].

Better hybrids were obtained at Odessa when pollen from the maternal parent was added to that of the pollinator or was included in a pollen mixture comprising several varieties. For instance $F_1$ hybrids of Talalihin 186 x (Majak [Lighthouse] + self pollen) outyielded the hybrids obtained without the addition of the maternal parent and produced a greater number of early fruits.
In another experiment, Štambovyj 13 [Bush 13] was pollinated by Odesskij Salatnyj [Odessa Salad] or by Odesskij Salatnyj + self pollen. The $F_1$ comprised 96·8% and 94·5% hybrids respectively.

847 LESLEY, M. M. & LESLEY, J. W.
**Male-sterile mutants in the tomato from seed treated with the radioactive isotope $P^{32}$.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 339–43.

Male-sterile plants which were vigorous, ♀ fertile and normal in meiosis were obtained from material derived from $P^{32}$-treated seeds. Male sterility depended on a single recessive gene.

848 GOROBEC, A. M.
**(Length of life of tomato pollen).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1958 : No. 1 : 11–15. [Russian].

The pollen of Štambovyj Karlik [Bush Dwarf] and Krajnij Sever [Far North] was kept under laboratory conditions for different periods of time and then used for pollination between the two varieties. It was found that the pollen remained viable for more than four days but that keeping it a few days longer caused reduction in the weight of fruit and in the number of seed in a fruit; the percentage fruit set remained unchanged.

849 MARSHALL, H. H.
**Polyembryony in tomatoes.**
Canad. J. Pl. Sci. 1958 : **38** : 67–72.

Twin seedlings obtained from crosses between Bounty $F_1$ hybrid x FN21 and Bounty $F_1$ hybrid x FN23 were subjected to genetic analysis to examine the mechanisms of polyembryony. Most seedlings were from parents heterozygous for the gene *U* and $F_3$ segregation data indicate that simple polyembryony is the most likely origin of the majority of twins.

850 TAPLEY, W. T., VITTUM, M. T. & PECK, N. H.
**Choose the right tomato variety.**
Fm. Res. 1958 : **24** : No. 2 : p. 4.

The results of trials carried out over the last six years at Geneva, NY, indicate differences between varieties in their response to irrigation. The unreleased line N2–911 gave 2·13 tons of marketable fruit per inch of irrigation water in 1957 while in the same year the corresponding value for Gem was only 0·07 tons.

851 GILBERT, J. C., MCGUIRE, D. C. & TANAKA, J.
**Tobacco mosaic virus resistance combined with root knot resistance in new tomato hybrids.**
Hawaii Fm. Sci. 1958 : **6** : No. 4 : 7, 8.

$F_1$ hybrids combining dominant tolerance of tobacco mosaic with dominant resistance to root-knot nematode have been obtained at the Hawaii Agricultural Experiment Station.

HES5775 and 5794 constituted the mosaic-tolerant parents. Lines breeding true for these two characters are being developed.

852 Generalov, G. F.
**(For more exacting demands in breeding work).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 2 : 9–11. [Russian].

Breeding research with pulses in the USSR is criticized on the grounds that (1) new varieties on testing often prove less productive than older varieties and are less resistant to fungi and bacteria and (2) most have been obtained by selection instead of hybridization. It is thought that good results might be obtained by the latter method and by employing forms with valuable economic properties from the extensive collection of pulses of the Institute of Plant Industry.

853 Rieger, R. & Michaelis, A.
Cytologische und stoffwechselphysiologische Untersuchungen am aktiven Meristem der Wurzelspitze von *Vicia faba* L. I. Der Einfluss der Unterwasser-Quellung der Samen auf die chromosomale Aberrationsrate. **(Investigations of the cytology and metabolic physiology of the active meristem of the root tip of *V. faba* L. I. The influence of underwater-soaking of seeds on the rate of chromosome aberrations).**
Chromosoma 1958 : **9** : 238–57.

The frequency of spontaneous chromosome aberrations in root tips of *V. faba* var. *minor* was significantly increased by soaking seeds in tap water for 12 to 96 hr. before germination. Fragments, translocations and triradials were found in up to 65% of all the cells in root tips from seeds which had been soaked for 72 hr. For those seeds which had received 48, 72 or 96 hours of presoaking, the maximum number of aberrations was found after a recovery period of 120 hr. and longer periods of recovery resulted in lower frequencies of observed aberrations. Similar chromosome aberrations were found in seeds which had been kept in an atmosphere of nitrogen for 24 to 96 hr. It was therefore thought probable that anaerobic respiration resulted in the production of automutagenic substances. Breaks only occurred in certain regions of the chromosomes and were more frequent on m than on SAT chromosomes.

854 Arruda, H. V. de
Correlação entre o pêso da planta e o das sementes, em variedades de feijoeiros. **(Correlation between plant weight and seed weight in bean varieties).**
Bragantia 1957 : **16** : 385–88.

A comparative study of nine Brazilian varieties showed that the coefficients of regression between weight of stems and leaves and weight of seed for each variety did not differ significantly from 0·34.

855 Popescou, C. T.
Influence du greffage sur la transmission du parfum du *Dianthus caryophyllus* aux fleurs du *Phaseolus vulgaris* (Soissons à rames). [**Influence of grafting on the transmission of the scent of *D. caryophyllus* to the flowers of *Ph. vulgaris* (Soissons à rames)**].
CR Acad. Sci., Paris 1958 : **246** : 3098–100.

*D. caryophyllus* was successfully grafted by inarching to the scentless bean Soissons à rames [Branched Soissons]. In the first year the flowers of the two graft components did not differ from those of the controls, but in the second year, the grafted plants having been retained through the winter, the flowers of the bean had a faint scent which in subsequent years, after continued vegetative maintenance, became as intense as that of the *Dianthus* although different in quality. The scent was transmitted to plants grown from seeds from the scented bean flowers.

856 Moore, J. F.
**Golden Lake, a new variety of wax pole bean.**
Sta. Circ. Wash. agric. Exp. Sta. 1958 : No. 333 : Pp. 3. (Mimeographed).

This new variety has been developed at the Western Washington Experiment Station for regions west of the Cascade mountains, where a well adapted variety has not previously been available. Its parents were Puregold and Blue Lake 65 and it has the climbing habit of Blue Lake, reaching six to seven feet, but with golden yellow pods. The pods are smaller than those of Blue Lake but yields are similar and the season is similar to that of Blue Lake 228. Golden Lake is resistant to common bean mosaic and to pod and leaf rust. The new variety is intended primarily as a home garden type but the beans are suitable for either home or commercial canning.

857 Ziver, A. & Moreno, O.
Grado de poder germinativo en porotos. **(Degree of germinating ability in French beans).**
Agricultura téc., Santiago 1956 : **16** : 92–96.

In field tests of five Chilean commercial varieties, Red Kidney showed the highest germination percentage and reached maximum germination in 10–15 days. Arroz [Rice] had the lowest germination percentage and Coscorrón the lowest germination rate. Germination percentages were higher in the greenhouse than in the field, Red Kidney showing the least differences.

858 Tasaki, J.
**(Studies on the reproductive physiology of *Phaseolus angularis*. II. On pollen germination).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **26** : 275–76. [Japanese].

Optimum conditions for artificial germination are a medium containing 1% agar and 30% sucrose and adjusted to pH 5·4–5·8, and a temperature of 25° C. The pollen is best preserved at 7° C. and 20% humidity.

859 **Lobed leaf-mutant in blackgram (*Phaseolus mungo*, Linn).**
Curr. Sci. 1958 : **27** : p. 191.

At Kovilpatti, a plant of selection 212 was found to have three lobes instead of the normal trifoliate leaves. The inheritance and ontogeny of this character are being studied.

860 Massieu, G. H., Cravioto, R. O. & Suárez-Soto, L. M.
Contenido en metionina, lisina y triptofano en variedades de frijol (*Phaseolus vulgaris* L.). [**Content of methionine, lysine and tryptophane in French-bean varieties (*Ph. vulgaris* L.)**].
Ciencia, Méx. 1958 : **18** : 24–28.

Total protein and methionine, lysine and tryptophane contents were determined for 66 varieties, mainly from Mexico or Guatemala. In general, the content of each aminoacid was correlated with total protein. The highest protein content, 29·30% in the dry bean, was in the variety Gto. 50.

861 Frazier, W. A., Baggett, J. R. & Sistrunk, W. A.
**Transfer of certain Blue Lake bean pod characters to bush beans.**
Proc. Amer. Soc. hort. Sci. 1958 : **71** : 416–21.

A preliminary report is given of experience gained at Oregon State College in back crossing to transfer the pod quality of Blue Lake to bush types. The bush selections within the $F_2$ progeny of each back cross have been used as ♀ parents each year, with the exception of 1955, when the recurrent parent Blue Lake constituted the ♀ parent. In 1957, the work reached the stage of study of progeny from the fifth back cross, and sixth back crosses to Blue Lake were effected. Bush types bearing pods closely resembling those of Blue Lake in colour, shape, fleshiness, roundness, smoothness, short spur and short neck have been obtained. Most bush segregates tend however to possess a sprawling, prostrate habit. A minimum of three major recessive genes, possibly with many modifiers, determine the upright habit. A distinct dwarf bush type was also found to be conditioned by three major recessive genes. Leaf distortions and mottling, occurring frequently among segregates of the initial crosses of bush x climbing types, have largely disappeared after continued back crossing. A persistent leaf distortion of bush plants, resembling the effect of 2,4-D, was eliminated after Blue Lake had been used as ♀ parent in 1955. The abnormality was therefore under cytoplasmic control. Relatively short pods have been characteristic of most bush plants, even after four back crosses. Since the pods are shorter than those of each parent, it is suggested that a physiological block to attainment of full pod length may be operative in a genotype similar to that of the climbing type except for genes for the bush habit. An additional recurrent parent, with longer pods, is being utilized.

862 Bocanegra S., S., Brown V., L., Dongo D., S. & González B., J.
Labor del programa de frijol en el Perú (campaña 1957). [**Work of the bean programme in Peru (season 1957)**].
Inf. mens. Estac. exp. agríc. La Molina 1958 : **32** : No. 369 : 1–13. [Mimeographed].

Work on *Phaseolus* conducted during 1957 falls into four sections: collection, comparison, small-scale multiplication and hybridization of varieties. In the varietal collection, established at Virú, Ate and Chincha, several introduced varieties have been distinguished by their earliness, while Peruvian varieties tend to be semilate or late. Some Venezuelan and Colombian varieties were both early and disease-resistant and are to be used in breeding. In trials at Virú and Chincha, Bayo [Tan] gave the highest yield of 12 varieties, but was less

good than Canario in quality. The study of crosses made with the aim of combining the yield characters of Bayo and Canario with the disease resistance of introduced varieties continued; selections showing good resistance but unsatisfactory in quality have been obtained.

863 Hassan Ahmed Azzam
**Inheritance of resistance to *Fusarium* root rot in *Phaseolus vulgaris* L., and *Phaseolus coccineus* L.**
Diss. Abstr. 1958 : **18** : Publ. No. 24,624 : 32–33. (Abst.)

A study was made of the inheritance of reaction to *F.* (*Hypomyces*) *solani* f. *phaseoli* in crosses of the susceptible variety OSC22 of *Ph. vulgaris* with two tolerant lines, viz. a Mexican line of *Ph. vulgaris* and line 2014 of *Ph. coccineus*. Two or three major recessive genes conditioned the tolerance of *Ph. coccineus*. Modifiers may also have affected the reaction of segregates of OSC22 x 2014. Data on OSC22 x Mexican suggested that tolerance depended on three major recessive genes, or possibly less than three major genes and several modifiers.
Plant pigmentation in OSC22 x Mexican depended on a single pair of genes, with green recessive. Seed colour in the same cross was controlled by two genes, an $F_2$ ratio of 9 black : 3 brown : 4 white being obtained. A very close association was observed between seed and plant colour.

864 Ryder, E. J.
**The effects of complementary epistasis on the inheritance of a quantitative character, seed size in lima beans.**
Agron. J. 1958 : **50** : 298–301.

Preliminary studies of models of gene action in various generations showed that the most striking feature of complementary epistasis is the depression of the generation means during the process of inbreeding. A progressive depression of this kind was found in the analysis of seed size both in the $F_1$–$F_3$ generations and in successive back crosses of the cross L96 x L44. Further indications of complementary epistasis were given by significance of scaling statistics, the skewness of the generation frequency distributions and means and the distortion of other genetic mechanisms detected in the results of analysis of variance components and factorial analysis. In the factorial analysis, no satisfactory fit to any model was obtained, possibly because of the complexity of the genetic basis of the character.

865 Purss, G. S.
**Studies on varietal resistance to stem rot (*Phytophthora vignae* Purss) in the cowpea.**
Qd. J. agric. Sci. 1958 : **15** : 1–14.

Local and introduced varieties of cowpea were tested for their resistance to *Ph. vignae* under glasshouse, nursery-plot and field conditions in Queensland. The varieties were grouped into three classes according to their reaction. The first group included varieties which are susceptible under all conditions; the popular variety Poona came into this class. Secondly there are varieties which are susceptible in pots but show varying reactions under other conditions. Malabar and Giant for example, have shown good field resistance. Cristaudo only maintains good field resistance when the inoculum level is low; its resistance also breaks down when seasonal conditions favour the disease. Blackeye 5, Havana and Santiago are in the third group which are resistant under all conditions. Poona was crossed with Blackeye 5 and it was found that the resistance of Blackeye 5 is dominant to the susceptibility of Poona. The hybrids were back crossed to Poona, the aim being to introduce resistance into this variety.

866 deZeeuw, D. J. & Ballard, J. C.
**A test strain of Black cowpea.**
Plant Dis. Reptr. 1958 : **42** : p. 898.

The variety Black ordinarily gives a susceptible reaction to tobacco ringspot virus. A mutant of this variety shows a resistant reaction consisting of local lesions, dependent on a single dominant factor.

867 Lanza, F.
Prove di adattamento e resa di sei cultivar di soia. (**Tests of adaptation and yield of six cultivars of soya bean**).
Ann. Staz. chim-agr. Roma : Ser. **3** : 1957 : Publ. No. 128 : Pp. 22.

In tests carried out near Rome, differences were detected between six varieties from the USA in respect of time of maturity when sown at different dates, and of yield. The highest yields were given by the late-maturing varieties Roanoke and Ogden, the former having given up to 56 c. of seeds per ha. when sown in early May.

868 Kato, I., Kawahara, M., Naito, Y. & Taniguchi, R.
**(Studies on earthing up soya beans. II. On adventitious-root development after earthing up and varietal differences in this respect).**
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1957 : No. 4 : 69–73. [Japanese].

An extensive series of Japanese varieties was examined for number of adventitious roots formed when the plants were earthed up. Wide intervarietal differences were observed. Some correlation was noted between the responses of parents and offspring. Late-maturing varieties tended to form more adventitious roots than early forms.

869 Collins, F. I.
**Breeding for oil content.**
Soybean Dig. 1958 : **18** : No. 7 : p. 26.

At the University of Illinois, investigations were carried out to determine how the composition of soya beans varies within plants and between plants. It was found that seeds from the lower parts of plants of indeterminate growth habit, such as the varieties Lincoln and Earlyana, contained about ½% more oil and 1% less protein than seeds from the upper parts. Seeds from the terminal node may contain as much as 6% less oil than those from the lowest nodes. The range in oil content was much narrower in varieties of determinate growth such as Hawkeye and Richland. The variety Jogun was peculiar in that it had the highest oil content in seeds from the terminal raceme. All the plants of one variety were similar in their pattern of oil content. The high-yielding plants within a drilled row produced seed with a higher oil content than the low-yielding plants. Hence it was concluded that selection from a segregating population of single plants for genetically-determined high oil content should be made only on plants of comparable yielding capacity and grown under similar conditions.

870 **Find nematode resistant soy lines.**
What's New Crops Soils 1958 : **10** : No. 9 : p. 29.

Four soya bean lines out of 3000 tested at Raleigh, NC, were found to restrict the reproduction and population build-up of cyst nematodes in their roots and will be used in a breeding programme.

871 Matsumoto, S. & Kurosawa, T.
**(On the boring into soya-bean pods of the larvae of *Grapholitha glycinivorella*).**
Hokkaido Nogyo Shikenjo Hokoku/Rep. Hokkaido agric. Exp. Sta. 1957 : No. 73 : 119–26. [Japanese].

Fifteen Japanese varieties were studied. Number of entrance holes of the larvae was highly correlated with pod length in the case of pubescent varieties but though this correlation held for glabrous varieties in 1953 it failed in 1954. Fewer eggs are laid on glabrous than on pubescent varieties and the number of entrance holes per unit pod-length is less in the glabrous forms.

872 Die "fasciata"-Formen — ein neuer Erbsentyp — sind wirtschaftlich von Bedeutung. **(The *fasciata* forms, a new type of pea, are of economic importance).**
Saatgutwirtschaft 1958 : **10** : 213–14.

A report is presented of a visit to the breeding station of the firm van Waveren and de Bres, at Rosdorf, where considerable progress has been made in breeding useful peas of the *fasciata* type. Attention is also being paid to improving other agronomic characters of pea varieties, including resistance to disease. Breeding of many other vegetables is also in progress.

873 Steikhardt, H. & Katzenberger, W.
Ergebnisse mehrjähriger Futtererbsen-Sortenversuche. **(Results of several-year variety trials of fodder peas).**
Dtsch. Landw. Berl. 1958 : **9** : 179–81.

The characteristics of several fodder-pea varieties grown in the German Democratic Republic are described and the results of recent varietal trials are reported, data being given on yield of seed, straw, dry matter, fresh fodder and crude protein.

874 Brenna, H. K.
Sortsforsøk med sukkerert 1953–1955. **(Varietal trials of sugar pea, 1953-1955).**
Forskn. Fors. Landbr. 1958 : **9** : 233–43.

Details of yield, earliness, pod size and plant height are given for 29 varieties and strains tested at 3 stations in Norway. Twelve varieties are recommended.

875 Rosen, G. von
**On the genetics of dwarf strains in Pisum.**
Hereditas, Lund 1958 : **44** : 123–44.

The characteristics and genetics of dwarf types

already reported as occurring in *Pisum* are analysed, and information is given on new dwarf mutants derived from two crosses of *P. sativum* with *P. abyssinicum*. Two mutants, designated dwarf and low dwarf, were obtained from a combination with P de Haan 204 as the *P. sativum* parent. The genotypes *le* $Cry_1$ $cry_2^s$, *le* $cry_1$ $Cry_2^{dw}$ and *le* $cry_1$ $Cry_2^{lw}$ are respectively assigned to P de Haan 204 and these two mutants. From the second cross, in which P de Haan 201 was the *P. sativum* parent, the dwarf mutant *nana* was secured. This parent and mutant are respectively given the genotypes *le* $cry_1$ $Cry_2$ and *le* $cry_1$ $Cry_2^{na}$. As reported by previous investigators, normal *vs.* reduced length of the organs is conditioned by the basic gene pair $Cry_1cry_1$ and another pair *Lele*, while the multiple-allelic series $Cry_2$–$cry_2^c$–$cry_2^s$ also influences habit, the recessive alleles $cry_2^c$ and $cry_2^s$ counteracting the effect of *le* and $cry_1$ in producing the dwarfed condition. $Cry_2$–$Cry_2^{dw}$–$Cry_2^{lw}$–$Cry_2^{na}$ are regarded as constituting a dominant multiple-allelic series for dwarfness. On the grounds of the dominance of the change at $Cry_2$ and linkage data, it is suggested that the origin of the mutants from the first cross involved not only mutation at this locus but also position effects occurring in connexion with translocation. The relationship between the two series of alleles at $Cry_2$ is discussed in terms of the direct role the gene may play in the reactions of growth-regulating enzymes.

876 Joubert, T. G. la G.
**A new pea variety—Satellite T.P.**
Fmg. in S. Afr. 1958 : **34** : 30–31.

The new dry pea variety described here was developed from a cross between a summer variety, Black-Eyed Susan, and Asgrow 40, at the Horticultural Research Station, Pretoria, S. Africa. It is a dwarf variety, reaching about two feet in height, and the seeds are ready for harvest in four and a half months or less from the time of sowing. They are suitable for the manufacture of split peas or pea flour. The new variety is more resistant to *Erysiphe polygoni* than the standard variety Rondo and gives higher yields.

877 Gilbert, J. C.
**Manoa Sugar : new mildew resistant edible podded pea.**
Hawaii Fm. Sci. 1958 : **7** : No. 1 : 1–2.

Manoa Sugar is now available at the Hawaii Agricultural Experiment Station. It contains a recessive gene for resistance to *Erysiphe polygoni*, this gene being originally found in the accession PI185183. Back crossing to edible-podded types adapted to the Hawaiin climate resulted in the production of lines which combined resistance to mildew with other desirable characters; from such a line Manoa Sugar was selected. It produces its first mature pods a little later than Dwarf Grey Sugar but continues to yield over a longer period of time; under uncrowded conditions, it may produce more than 100 mature seed pods per plant. There are two strains of this variety; strain A has pods resembling those of Taichung 9, which was used in breeding Manoa Sugar. Strain B is slightly earlier than A and its pods resemble those of Dwarf Grey Sugar in size and shape. Both strains are climbing vine types and their table quality has proved satisfactory.

878 Atabekova, A. I.
**[Cytological studies of cultivated pea (*Pisum sativum*)].**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1958 : No. 2 : 211–16. [Russian].

The development of the pollen and pollen tubes is described. The generative nucleus in *P. sativa* normally divides only upon germination of the pollen tube, the pollen being of the binucleate type. However in some cases, division of the generative nucleus was observed before germination. The vegetative cell normally disintegrated as the pollen tube germinated. The pollen ripened and germinated before the flower opened, thereby almost completely precluding cross pollination.

879 Ottosson, L.
**Growth and maturity of peas for canning and freezing.**
Växtodling 1958 : No. 9 : Pp. 112.

An account is presented of a detailed study of the changes occurring in canning peas during maturation; in addition, factors influencing the amount of heat required during the growing season and methods of determining maturity were investigated. A variety with smooth seeds, Alaska, was found to develop and ripen more quickly than several wrinkled varieties. Also the starch content of Alaska peas increased more with the degree of maturation than that of wrinkled peas and structural differences were noted in the starch of the two kinds. The weight of the seed of Alaska continued to increase up to a tenderometer reading of 200,

whereas for wrinkled peas, the highest weight was found at a reading of 140–160.

880 Walker, M.
**Palatability tests of edible podded peas.**
Hawaii Fm. Sci. 1958 : **7** : No. 1 : p. 7.
Of the five varieties tested at the Hawaii Agricultural Experiment Station, Manoa Sugar strain B was found most palatable and Manoa Sugar strain A came second in order of preference.

881 Argikar, G. P.
**Inheritance of the *tiny-leaved* and *alternifolia* forms in *Cicer arietinum* L.**
Curr. Sci. 1958 : **27** : 183–84.
The $F_1$ hybrids from a cross between the tiny-leaved mutant and the *alternifolia* form had normal leaves. Segregation in the $F_2$ gave frequencies fitting a 9 : 3 : 4 ratio for normal, *alternifolia* and tiny-leaved forms respectively; the $F_3$ segregation confirmed the dominance of the normal form. The genotypes of the *alternifolia* and tiny-leaved forms are designated as *Slv Slv Tlv Tlv Nlv Nlv Glv Glv alv alv* and *Slv Slv tlv tlv Nlv Nlv Glv Glv Alv Alv* respectively; it is also suggested that the normal-leaved plant in its homozygous state has the genotype *Slv Slv Tlv Tlv Nlv Nlv Glv Glv Alv Alv.*

882 Pollack, B. L.
**New home garden sweet corn available by 1959 season.**
Sci. Fmr., Pa. 1958 : **5** : No. 4 : p. 6.
The yellow hybrid Pennlewis ripens at the same time as Carmelcross, and about 4 days earlier than Golden Cross Bantam. Suitable for use when fresh, frozen or canned, it is highly resistant to bacterial wilt and withstands dry weather.

883 Latypov, A. G.
**(The best mint varieties).**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 1 : 68–70. [Russian].
New productive varieties with oil of high quality have been bred: Priluki 6 and Priluki 324 at the Ukrainian Oil Plants Breeding Station and 541 at the Institute of Medicinal Plants. All three yield more oil per unit area than the Ukrainian standard Perečnaja [Pepper]. The oil of Priluki 324 is of superior quality to that of Perečnaja, that of Priluki 6 of the same quality as that of Perečnaja. The oil of 541 is rated highly for its high content of menthol.

## ECONOMIC LOWER PLANTS

884 Carr, J. G.
**A strain of *Acetobacter aceti* giving a positive cellulose reaction.**
Nature, Lond. 1958 : **182** : 265–66.
The above strain differed from a typical cellulose producer such as *A. xylinum* in that it did not form a cartilaginous pellicle in liquid media, failed to show coherent growth on solid media and was actively motile, possessing peritrichous flagella. Its cellulose-producing capacity was identified by the iodine - sulphuric acid test, the limitations of which are pointed out. As shown by Shimwell [cf. XXVII, 2551], members of the genus *Acetobacter* are particularly prone to mutation. It is suggested that this strain represents one end of the mutational range, with *A. paradoxum* at the other.

885 Alihanjan, S. I., Gol'dat, S. Ju. & Teterjatnik, A. F.
**(The mutagenic effect of the combined action of ethyleneimine and ultraviolet rays upon actinomycetes).**
Dokl. Akad. Nauk SSR (Proc. Acad. Sci. USSR) 1957 : **115** : 1015–17. [Russian].
Treatment of *Streptomyces aureofaciens* and *S. griseus* strains with ethyleneimine previous to exposing them to ultraviolet radiation appreciably increased the frequency of mutations controlling the production of aureomycin and streptomycin respectively.

886 Gröger, D.
Zur Züchtung des Mutterkorns. **(On breeding ergot).**
Abh. dtsch. Akad. Wiss. Berl. 1956 (1957) : No. 7 : 243–49.
Any one strain was generally higher in alkaloid content on rye than on grasses but retained its qualitative characters on rye even after passage through grasses. It was chiefly the water-soluble alkaloids which varied in quantity according to host.
After exposure of monoconidiosporal strains to X rays at 10–25 kr., marked retardation in growth was found and some mutants with increased alkaloid content were obtained. One mutant produced leucosclerotia and resembled spontaneous leuco-forms in being lower in alkaloid content than the initial strain but qualitatively similar.

887 Kybal, J., Horák, P., Brejcha, V. & Kudrnáč, S.
Monokonidienisolation und deren Bedeutung bei der Selektion von Rassen und Stämmen des Mutterkorns. (**Isolation of monoconidia and its significance in selecting races and strains of ergot**). Abh. dtsch. Akad. Wiss. Berl. 1956 (1957) : No. 7 : 236–42.

From a number of sclerotia from samples obtained from several European countries, monoconidial strains were isolated at the Prague Institute for Medicinal Plant Research; these were found to belong to a number of races differing in alkaloid composition.

All but one of the sclerotia gave rise to a mixture of races [cf. XXVIII, 4140]. The various races and strains isolated could be distinguished in form and colour of the sclerotia but analysis of the relation between these characters and alkaloid content has not yet been carried out.

888 Atal, C. K. & Schwarting, A. E.
**A note on the variability of alkaloid content of domestic ergot.**
J. Amer. pharm. Ass. 1957 : **48** : p. 451.

Four samples of ergot of rye from Canada, Connecticut, Minnesota and North Dakota varied in total alkaloid content between 0·000 and 0·729%, with averages of 0·284–0·361%. Water-soluble alkaloids formed 0·095–0·146% of the total alkaloid.

889 Alihanjan, S. I.
(**The problems of breeding producers of antibiotics. The first results of radiation breeding**).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel. biol. (Biol. Ser.) 1958 : **63** : No. 3 : 79–96. [Russian].

An account of breeding active strains of *Penicillium* and *Actinomyces* is given. Strains of microorganisms producing appreciably larger amounts of penicillin, terramycin, streptomycin, chlortetracyclin, albomycin and vitamin $B_{12}$ were obtained. The following methods were employed: (1) hybridization + ethyleneimine + ultraviolet ray treatment; (2) ultraviolet rays; (3) ultraviolet + X-ray treatment; (4) X-rays, and (5) ethyleneimine treatment.

890 Hawthorne, D. C.
**The genetics of alpha-methyl-glucoside fermentation in Saccharomyces.**
Heredity 1958 : **12** : 273–84.

Investigations at the Department of Microbiology, University of Washington, provided evidence that fermentation of α-methyl-glucoside depended on five interacting polymeric genes, $MG_1$, $MG_2$, $MG_3$, $MG_4$ and $MA_1$. The following combinations of dominant genes conferred the capacity to ferment this glucoside: $MG_1$ $MG_2$, $MG_2$ $MG_3$ and $MG_4$ $MA_1$. When crosses were made which resulted in the segregation of a single gene at a time, 2 : 2 ratios for fermenters : nonfermenters were obtained, except for 4 anomalous 1 : 3 asci. Three of the aberrant asci involved the combination $MG_4MA_1$ and could be explained by the petite-spore clones obtained from these asci, since it was demonstrated that petite strains carrying $MG_4MA_1$ were unable to ferment α-methyl-glucoside. The irregular segregation in the fourth ascus is attributed to mutation of $MG_2$.

891 Bevan, E. A.
**Spontaneous change from heterozygosity to homozygosity at specific loci in diploid yeast. . .**
New Phytol. 1958 : **57** : 251–53.

The frequencies of spontaneous mutation from heterozygosity to the recessive homozygous condition at *ad* (adenine requirement and red phenotype), *me* (methionineless), *tr* (tryptophaneless) and *ur* (uracil requirement) in diploid yeast were much higher than in colonies derived from ultraviolet-irradiated haploid cells. Two possible alternative explanations of the high frequency of mutation in diploid yeast are briefly discussed: mitotic crossing-over and alternative replication of pseudoalleles.

892 Lindegren, C. C. & Pittman, D. D.
**Effects of environment (radiation, substrate and allelic genes) on the melezitose gene in *Saccharomyces*.**
Nature, Lond. 1958 : **182** : 271–72.

The locus *MZ* controls the formation of the adaptive enzyme melezitase which acts on five substrates: turanose (T), maltose (M), sucrose (S), methyl-α-glucopyranoside (G) and melezitose (Z), each of which may serve as an inducer of melezitase. Seven alleles have been detected at this locus in previous investigations and respectively designated *TMSGZ*, *TMSGz*, *TMSgZ*, *TMSgz*, *TMsgz*, *Tmsgz* and *tmsgz*, the capitals indicating the substrates capable of inducing melezitase in glucose-grown cultures. Cells in which melezitase has been induced by an appropriate substrate are able to split, without further adaptation, the substrates which do not act as inducers for the genotype in question. For example, a glucose-grown

culture of the genotype *TMSgz* responds to neither methyl-α-glucopyranoside nor melezitose but splits both these substrates after exposure to turanose, maltose or sucrose. Ultraviolet treatment brings about an alteration of *TMSGZ* to one of five alleles in the relative frequencies *TMSGz* > *TMSgz* > *TMsgz* > *Tmsgz* > *tmsgz* [cf. XXVIII, 1395]. With the exception of *tmsgz*, the "degraded" genes have proved capable of undergoing reverse mutation as the result of exposure to substrates which the mutants could not utilize. Back mutation of *Tmsgz* on melezitose resulted in only *TMSGZ* but back mutation of *Tmsgz* on maltose led to the production of both *TMSGZ* and *TMSGz*. Cultures of *tmsgz* revert to *TMSGZ* if exposure to a substrate is preceded by X irradiation. The linear curve obtained for the relationship between X-ray dose and frequency of back mutation of *tmsgz* to *TMSGZ* and the failure to detect intermediate genotypes indicate that the change is a single event. It is inferred that X rays and the substrate act synergistically and that X rays render the gene mutable whereas the substrate determines the specificity of the mutation. Back mutants resulting from exposure to X rays + substrate are of either the totipotent *TMSGZ* type or of a type showing variability in capacity to respond to the inducers maltose, methyl-α-glucopyranoside and melezitose. The variable mutants may originally be of the type *TMSGZ* but may lose some recently acquired capacities rather readily. The stability of the capacity S may mean that a mutation at another locus (*SU*) has occurred. The variable mutants are under further investigation to determine the nature of their instability. The reconstituted gene *TMSGZ* is functionally less active than the original one; the "restorative" mutations resemble the repair of a damaged locus rather than the construction of a new gene. A capacity not found in *Saccharomyces* might be introduced by exploitation of the combined effects of unequal crossing over and the synergistic effects of substrate and radiation.

893 Kocwa, E.
Wyosobnienie i charakterystyka nowej kultury drożdży melasowych. (**Isolation and characteristics of a new culture of molasses yeast**).
Prace Inst. Labor. Bad. Przem. Roln. Spoż., Warszawa 1956 : No. 1 : 1–13. [from: Pol. Tech. Abstr. 1957 : No. 3 : 97–98].
A new culture of *Saccharomyces cerevisiae* named $O_{11}$, suitable for fermenting defective molasses, has been developed. It is resistant to high concentrations of mash, to acidification and to temperatures higher than those normally used in industrial production. Alcohol production is high.

894 Eddy, A. A.
**Presumed nuclear bodies isolated from yeast protoplasts using ultrasonics.**
Biochem. J. 1958 : **69** : No. 4 : 47P–48P.
An ultrasonic method has been devised by means of which the DNA in the yeast protoplast has been isolated in association with a body of about 2 μ in diameter. Using a special technique, in which protoplasts were transferred and disrupted in formamide, evidence was obtained suggesting that each protoplast contained a single body of this type, situated just outside the main vacuole.

895 Royan, S.
**The cyto-architecture of the yeast nucleus.**
Proc. Indian Acad. Sci. : Sect. B. : 1958 : **48** : 33–40.
A nuclear membrane enclosing structures which are regarded as corresponding to the chromocentres of higher organisms was observed in living cells of *Saccharomyces cerevisiae* from wort cultures 5–7 days old, under ordinary, phase-contrast and dark-ground illumination. Comparison of preparations stained with Feulgen and hematoxylin made possible the identification of a binucleate condition at the vegetative stage. Hematoxylin preparations in which the vacuolar membrane had separated from the cytoplasm confirmed the extravacuolar position of the nucleus.

896 Thyagarajan, T. R.
**The reaction of living vegetative cells and zygotes of *Saccharomyces carlsbergensis* to neutral red.**
J. Indian Inst. Sci. 1958 : **40** : 41–49.
Evidence was obtained confirming that the nucleus and vacuole are separate components of the cell, only the vacuole being stained by neutral red.

897 Aswathanarayana, N. V. & Subramaniam, M. K.
**An evaluation of the standards used in the study of the yeast nucleus.**
Proc. Indian Acad. Sci. : Sect. B. : 1958 : **47** : 263–73.
In an examination of living cells of *Saccharomyces cerevisiae* 'BY1' by the phase-contrast

microscope, the nucleus became visible in 1–2% of the cells from 6–8-day cultures in barley malt wort and in 0·5–1·0% of the cells from 10–12-day cultures in a medium containing galactose, peptone and yeast extract. The nucleus was extravacuolar and delimited from the cytoplasm and vacuole by a definite nuclear membrane. The nuclear matrix showed gradations in optical density. Observations on the nucleus in preparations of hydrolysed cells stained with hematoxylin or by the Feulgen technique were related to those on the living nucleus. The area stained by leucobasic fuchsin constituted only a portion of the nucleus. In order to make an adequate study of nuclear structure, examination of Feulgen preparations under phase contrast is considered necessary.

898 Hashimoto, T., Conti, S. F. & Naylor, H. B.
**Nuclear changes occurring during bud-formation in *Saccharomyces cerevisiae* as revealed by ultra-thin sectioning.**
Nature, Lond. 1958 : **182** : p. 454.

The nuclear membrane did not disappear during bud formation. Constriction of the nucleus was independent of constriction of the cell wall.

899 Takahashi, T., Saito, H. & Ikeda, Y.
**Heterothallic behaviour of a homothallic strain in Saccharomyces yeast.**
Genetics 1958 : **43** : 249–60.

A hybrid strain of *S. cerevisiae* was produced between a homothallic parent and a heterothallic stock by means of the "spore to spore copulation technique". With the aid of a newly devised method termed the minimal plate mating technique, the mating reaction of the homothallic parent and of homothallic segregates from the hybrid was determined, the existence of mating potency even in homothallic yeast thus being established. The homothallic parent behaved as mating type α, the hybrid giving homothallic αα and *aa* diploid segregates. The hybrid segregated in a regular manner with respect to homothallism, mating type and biochemical characters, with the exception of fermentation of α-methyl glucoside, which appeared to be under the control of two or more genes. Possible tetraploids and triploids were respectively obtained from matings between (1) *aa* and αα diploids and (2) *aa* or αα strains with α or *a* haploids.

900 Lindegren, C. C., Nagai, S. & Nagai, H.
**Induction of respiratory deficiency in yeast by manganese, copper, cobalt and nickel.**
Nature, Lond. 1958 : **182** : 446–48.

Mn, Cu, Co and Ni ions induced respiratory deficiency with high frequency. This high frequency and its relative independence of chromosome number suggested that most of the deficiencies were due to the destruction or inactivation of cytoplasmic granules rather than to effects on the genome. Na, K, Li and Sr ions failed to induce any respiratory deficiency. Mercuric chloride and arsenic acid also failed to do so, possibly on account of their extreme toxicity. In an addendum it is noted that 0·2% caffeine proved to be highly efficacious in the production of respiratory deficiency.

901 Toledo, O. Z. de & Teixeira, C. G.
O emprêgo de leveduras selecionadas na fermentação do vinho. (**The behaviour of selected yeasts in wine fermentation**).
Bragantia 1957 : **16** : 251–60.

The behaviour during fermentation of 25 Brazilian strains was investigated and data are given on the volatile and total acidity of the resulting wine, content of aldehydes, alcohol and reducing sugars, extract, pH and Brix. Attention is drawn to the low volatile acid production of some of the strains, the lowest value resulting from use of strain 13, a sample of *Saccharomyces cerevisiae* collected from a Seibel 11342 vine in Campinas, São Paulo.

902 Swaminathan, M. S. & Ganesan, A. T.
**Kinetics of mitosis in yeasts.**
Nature, Lond. 1958 : **182** : 610–11.

Observations made on the course of mitosis and the mode of separation of daughter nuclei in *Saccharomyces cerevisiae*, *Zygosaccharomyces priorianus* and *Schizosaccharomyces pombe* are reported. The doubling observed in many nuclei at the end of mitosis but before separation of the daughter nuclei and the lack of correlation between budding and nuclear separation either in time or in the plane of movement were taken to indicate that anaphase and telophase are intranuclear, the chromosomes being distributed before any process analagous to cytocinesis commences.

# BOOK REVIEWS

903 ZIMMERMANN, K.
Technik des Versuchswesens und der Pflanzenzüchtung. (**The technique of experimental design and plant breeding**).
S. Hirzel Verlag, Leipzig 1955 : 3rd. Ed. : DM 25 : Pp. viii + 414 : 56 figs. : tables.

The controversy between the advocates of what the Germans refer to as the "old" and "new" methods of field trials is now dying down and the new methods, based on analysis of variance, are now becoming widely accepted in both Eastern and Western Germany. Dr. Zimmermann, of the Müncheberg institute, has played an important role in gaining the acceptance of the new methods in the German Democratic Republic, and his text book, now in its third edition, is planned so as to enable as wide a range as possible of agricultural investigators to set up and analyse field trials.

Unlike the usage in English-speaking countries, where agronomic technique and statistics are usually handled in separate publications, Dr. Zimmermann deals with all aspects of setting up a field trial. Thus, the earlier sections of the book give detailed explanations of the procedures to be followed in marking out plots, preparation of the soil, tillage operations, sowing and planting, staking, weeding, harvesting, assessing the crop, and recording. There are also short descriptions of such breeding techniques as hybridization, vernalization, induction of polyploidy and the induction of mutations, which are introductory rather than informative. The bulk of the book is occupied by very detailed descriptions of recommended layouts for field trials with instructions and examples how they are to be analysed. Very little previous mathematical knowledge is demanded. Only one of the old methods appears, the long-plot method; the new methods selected for general recommendation comprise randomized blocks, the Latin square, simple lattices, lattice squares, polyfactorial experiments and split-plot designs. Tables of squares, square roots, reciprocals, $t$, $p$ and $F$ conclude the volume.

904 ELLIOTT, F. C.
**Plant breeding and cytogenetics.**
McGraw-Hill Publishing Co. Ltd., London 1958 : 66s. : Pp. 395 : figs. : tables.

This new addition to the rather select company of plant breeding texts forms part of the McGraw-Hill Publications in the Agricultural Sciences and, of course, is produced with the excellent quality which characterizes that series. The author is Associate Professor of Farm Crops, Michigan State University, and he considers his text book "will undoubtedly be of more use and interest to advanced students and breeders than to beginners".

The subject matter is grouped into thirteen chapters of which the first two, The nature of crop varieties and The chromosome mechanism in heredity, and the last two, Handling plant materials after release as varieties and Organization for plant improvement, are somewhat indirect in their bearing on the actual work of producing new varieties. Altogether they amount to about a third of the text. The remaining chapters deal with recombination, mutations, polyploidy, chromosome substitution and aneuploid analyses (e.g. nullisomic analysis), plant introduction, self-fertilizing crops, cross-fertilizing crops, disease resistance and variety testing before release. The book is adequately illustrated and provided with a combined subject- and author-index. A most valuable feature is the provision of very full lists of references at the end of each chapter; it is particularly welcome to find the full titles of papers given.

As is hinted by the title, the best parts of the book are those dealing with methods of manoeuvring chromosomes, such as nullisomic analysis, chromosome substitution, and the use of irradiation to bring about incorporation of a small bit of chromosome from a distantly related parent. For the rest, the text suffers from defects which seriously reduce its value: some examples follow.

In the first place there are too many inaccuracies. Some of these may be merely due to careless proof reading, like the mating between two male-sterile plants indicated at the head of Fig. 1–20, but others are more serious. To describe "radiosiotopes like $P^{32}$ and $S^{35}$" moving "in the transpiration stream as ions of these elements" or to speak of "nuclear functions normally ascribed to elemental phosphorus and sulfur" seems too far away from reality even for a text book. And after reading (p. 224) "the additive genetic variance is the sum of the average differences associated with the two homozygotes for each of the gene pairs that condition characteristics under selection. The variance due to dominance is the sum of the differences between the heterozygote and the average of the two homozygotes for each of the gene pairs that condition the same characteristics", one is not surprised that the author has a strong tendency to avoid any quantitative treatment, even of topics that cry out for it.

In many places, the author's careless use of English causes unnecessary difficulties. For example (p. 231): "Palmer (1953) has pointed out that in transgressive breeding for quantitative characters, those which yield valuable crosses are rare." He really means, it appears later, that crosses which yield valuable varieties are rare.

As the well-known text, Methods of plant breeding by Hayes, Immer and Smith [XXV, p. 635] is published in the same series, one might expect the present work to be complementary to it. At his best, Professor Elliott does in fact provide a useful complement to the earlier book. There is, however, a very large area of overlapping and in this area the superiority of the older authors is all too evident.

J. L. Fyfe

905 Lerner, I. M.
**The genetic basis of selection.**
Chapman & Hall, Ltd., London & John Wiley & Sons, Inc., New York 1958 : 64s. : Pp. xvi + 298 : figs. : tables.

The Greeks distinguished between gods, demigods and mortals. We may do likewise in the realm of plant breeding, with the genetical mathematicians, Fisher, Wright, Kimura and their ilk dwelling on Mount Olympus, and the general run of plant breeders with their feet firmly planted on the earth. The demigods, notably exemplified by Professor Lerner, bring us news from more exalted regions and enable us to ascertain what use, if any, is the mathematical ambrosia circulated above.

Professor Lerner's previous book, *Genetic Homeostasis* [cf. XXV, p. 102] was a remarkable exposition of what was then a new outlook on population genetics. The present volume follows naturally on its predecessor and although its scope is ostensibly narrower, it provides an extremely clear presentation of current views on population genetics and their relevance to selection procedures. The mathematical demands made on the reader are of the slightest and most of the algebra is segregated into "boxes" which can be skipped by the unwilling. The basic theoretical conception running throughout the book is genetic coadaptation which is introduced in the initial chapter defining the Mendelian population. Quantitative inheritance is analysed in chapter 2 where methods of partitioning variance and estimating heritabilities are also described. A clear exposition is given of the somewhat controversial notion of polygenic balance and of the nature of phenodeviants.

Chapter 3 is rather miscellaneous and deals with population equilibrium, inbreeding, overdominance and genetic drift. On p. 100, the author amplifies and qualifies his earlier account of genetic homeostasis which has been wrongly understood by some authors.

Chapters 4 and 5 constitute the core of the book and describe in some detail experiments on the responses of animal populations, principally poultry, to the various types of selection, in particular mass and family selection. The causes for the frequently encountered cases of resistance to selection pressure are considered at length and are in general explained in terms of genetic coadaptation.

Plant breeders will be less interested in chapter 6 in which selection in connexion with hybridization and general and specific combining abilities are considered. These matters have only been tackled by animal breeders comparatively recently and they have borrowed largely from the experience of plant breeders who have accumulated an extensive specialist literature on these topics.

Chapter 7 exemplifies some cases of improvement of specific characters in poultry while the eighth and last chapter is a miscellany including such topics as intermittent selection, a rather elusive discussion on selection limits, and a short consideration of the possibilities of macroevolutionary changes.

Professor Lerner's book, whilst of most value to animal breeders, can also be strongly recommended to plant breeders for its very successful exposition of the application of mathematical genetics to practical breeding problems, for its making available to plant breeders the principal discoveries in the theory of breeding of such outstanding animal breeders as Dempster, Hazel, Lush and Robertson, and in particular for setting down with exemplary fairness the numerous lacunae between the mathematical theory and the results actually obtained in selection programmes.

906 Carter, G. S.
**A hundred years of evolution.**
Sidgwick & Jackson Ltd., London 1957 : 21s. : Pp. x + 206 : 4 figs.

In contrast to some more pretentious books on the same subject, Dr. Carter has written an unusually balanced account of evolution and of its historical setting. Since the author always has the general reader in mind, the level of exposition of the biological topics is elementary and the emphasis throughout is on the higher animals. Perhaps the most interesting aspect of the

author's handling of the biological material is his chapter on evolution and ecology in which use is made of the deme concept. A valuable feature throughout is the frankness with which unresolved problems are faced. Thus on p. 140, it is "admitted that even today our belief in the efficiency of selection depends on logical deduction rather than on the results of observation or experiment". Less satisfactory is the discussion on hybrid depression and heterosis on p. 153. The account of macroevolutionary processes is hardly satisfactory either, especially the problem of orthogenesis. It is not clear in what way "the evidence is clearly against the need for postulating" orthogenetic tendencies, and one is surprised that the author should spot light the logical hiatus in the statement: "In any case, an orthogenetic tendency would surely be present in all members of the line of descent of the horses, and not reversed in a few of them" by the revealing "surely".

A lacuna is the absence of any reference to recent fundamental advances in microbial genetics. It is hardly possible to deal with neo-Lamarckism adequately with such an omission.

The description of the philosophical and theological background of the Darwinian controversy is very good. In particular it is shown how the violence of the reaction to *The Origin of Species* was largely owing to its coincidence with the Evangelical revival. Perhaps Dr. Carter goes further than is necessary in describing materialism as the scientist's philosophy though it is undeniable that a passion for the universal extension of materialism was a potent factor in the period of acute controversy. The author evidently considers that speculations as to the psychological drives that underlay the development of Darwin's biological views are out of place in a book of this sort though the reader is told that Darwin would neither discuss nor admit responsibility for the religious or philosophical implications of his work.

907 BARNET, S. A. (Editor)
**A century of Darwin.**
William Heinemann Ltd., London 1958 : 30s. : Pp. xvi + 376 : 55 figs. : 5 plates.

The fifteen essays comprising this centennial celebration volume consider the significance of Darwin's work in such diverse fields as biology, geology, sociology and ethics.

The opening essay, Theories of evolution, by C. M. Waddington, is a straightforward account of Darwin's theory of evolution and of the neo-Darwinian theory that has resulted from integrating the older theory with Mendelian genetics. The principal interest is in the final section where the author gives an outline of his own researches on natural selection of developmental adaptability; this process bears some superficial resemblances to Lamarckian evolution. In Species after Darwin, T. Dobzhansky provides a succinct account of neo-Darwinian views on speciation, many of which he has been largely instrumental in developing. There are a few incautious statements here, as on p. 31, where the "grotesque and extravagant" forms of tropical animals *and plants* appear to be attributed to the need of the opposite sexes of the same species to recognize each other. On pp. 41–3, we have the familiar unrealistic equation made between the genetically-defined and taxonomic species. The species in asexually reproducing organisms are naturally a difficulty and the author is forced to conclude that they are no more than conventional constructs.

D. Michie's contribution, The third stage in genetics, comprises a selection of "anomalous" phenomena: nuclear differentiation in tissue transplants, nuclear transplants into frog eggs, aging in *Paramecium*, transduction, the experiments on tomato grafting of Glavinić [cf. XXVII, 4298], and the claim of Benoit *et al.* that hereditary changes can be induced in ducks by injection of appropriate DNA. These, it is thought, point towards a future syncretic genetical theory in which nuclear-somatic interaction in both directions is recognized.

Darwin and animal breeding is treated by J. Hammond. Special attention is paid to maternal influences (pp. 86–7) and to the significance of level of nutrition in animal selection.

A rather unconvincing plea for phylogenetic taxonomy is made by R. A. Crowson in Darwin and classification. The difficulties raised by pedomorphic evolution are brushed aside cursorily on p. 108 and far too uncritical reverence is paid to Dollo's Law. The efforts made on p. 113 to establish taxonomic categories on the basis of an absolute or generation time-scale are not happy and the statement on p. 117 that "it is possible, even probable, that the soft parts of Silurian *Lingula* differed radically from those of living ones" appears quite gratuitous. The author points out however with commendable fairness (pp. 110–1) exceptions to his rule that taxa should be "descended from a common ancestral species which they do not share with any form outside the group". Some final remarks on the psychological drives of systematists make entertaining reading.

A. S. Romer's paper on Darwin and the fossil record is a historical survey of the growth of paleontological evidence in favour of evolution. It is followed by an article by G. de Beer on Darwin and embryology, in which one is not surprised to find strong emphasis attached to pedomorphic evolution. A sober account of the putative course of human evolution, The study of man's descent, by W. le Gros Clark, is next. Differences between the mid-Victorian and contemporary outlook are conspicuously evident in S. A. Barnett's article on The "Expression of the emotions". Darwin's descriptions of animal behaviour tended to be anthropomorphic and anecdotal; the author explores the possibilities that the mechanisms exposed by depth psychology in human beings operate also in higher animals.

Some of the difficulties in developing a rigorous theory of sexual selection are discussed by J. Maynard Smith in a chapter so entitled. Darwin's major contribution to geology is assessed by C. M. Yonge in a paper on Darwin and coral reefs.

J. Heslop-Harrison's article on Darwin as a botanist will be of particular interest to readers of *Plant Breeding Abstracts*. The principal topics discussed are floral biology and plant movement. In connexion with the former a rather sanguine attitude is struck about the prospects for solving the "abominable mystery" of the diversity of floral structure on the basis of natural selection affecting plant-insect relationships. Some remarks on the faintly ridiculous ateleological pose considered proper for botanists make a fitting conclusion.

Unlike most of the contributions, D. G. MacRae's paper on Darwinism and the social sciences describes a reaction against Darwin rather than a development from him. J. M. Thoday, in Natural selection and biological progress, attempts a peculiarly difficult task, the elaboration of a mathematically tractable notion of biological progress unaffected by fluctuating human bias. Some success is achieved in developing a self-consistent scheme by defining biological progress as increase of fitness, where fitness is understood to mean the probability that descendants of the organism will have survived in their future environments, say 1–10 million years later. Whether a mathematically definite procedure for deriving a unique metric for progress as thus defined can be devised and whether Thoday's progress has any relationship with the value-charged concept in common use are quite other problems.

The last essay of all, Darwinism and ethics, by D. Diaches Raphael, is largely devoted to a critique of the biologically based ethical theories of Waddington and J. Huxley.

908 Oparin, A.
**The origin of life on the earth. Reports on the International Symposium, August 1957, Moscow.**
The Publishing House of the Academy of Sciences of the USSR (undated) : Pp. 391 : figs. : tables.

Some impressions by N. W. Pirie and J. D. Bernal of the 1957 International Symposium on the Origin of Life held at Moscow have already been noted [XXVIII, 1183–4]. The present volume comprises the texts of the papers presented to the symposium. The majority of the papers are by Russian authors, notably members of the Bach Institute of Biochemistry, but representatives from Belgium, Canada, Czechoslovakia, England, Germany, India, Italy, Japan and the USA also participated.

If the symposium is judged with strict reference to its title, it must be admitted that the residue of relevant fact in the tissue of hypotheses is very small. A more generous assessment of the symposium is possible, however, if it is viewed as a review on progress in fundamental biochemistry.

Some concrete results are reported in synthesizing organic compounds from inorganic substances or simple organic precursors. S. Miller, in Formation of organic compounds on the primitive earth, reports the formation of aminoacids and other organic acids from electric discharges in a mixture of methane, ammonia, hydrogen and water. It is supposed that HCN and aldehydes are formed initially, that these substances interact to give nitriles, and that the latter form the corresponding acids by Strecker synthesis. K. Bahadur, in The reactions involved in the formation of compounds preliminary to the synthesis of protoplasm and materials of biological importance, describes the formation of aminoacids from a mixture of paraformaldehyde, colloidal molybdenum oxide and water exposed to electric light from a 500-watt bulb. Two experiments on the synthesis of aminoacids, one by ultraviolet irradiation of an aqueous solution of H.CHO and an ammonium salt, and the other a repetition of Miller's work, are reported by T. E. Pavlovskaya and A. G. Passynasky in their paper, The primary formation of amino acids in ultraviolet rays and in electric discharge.

There are two papers on the problem constituted

by the uniformity of stereoisomerism in biochemical substances. In the first of these, Die Rolle der Dyssimetrie der Molekülen bei der Entstehung des lebenden Stoffes [The role of dyssymetry of the molecules in the origin of living matter], A. P. Terentjew and E. I. Klabunowski review work on the resolution of optically active substances by crystallization techniques. E. I. Klabunowski is also the author of the second paper, Die asymmetrische Katalyse [Asymmetrical catalysis], in which preferential formation of one or other optical antipode is reported to have been obtained by use of appropriate catalysts, in particular metal films on quartz crystals.

The most interesting paper on a possible mode of protein synthesis is by S. Akabori, On the origin of the fore-protein. He reports that polypeptides can be produced by polymerization of aminoacetonitrite on clay and that side chains can be introduced into polyglycine spread on clay by treatment with aldehydes.

The nearest approach to an experimental investigation of the organization of complex molecules into a living system is made by A. I. Oparin, who describes some instances of enhanced chemical activity in coacervate drops and in isolated protoplasts in a paper entitled Biochemical processes in the simplest structures.

Most of the remaining papers are theoretical rather than factual. They are as follows: V. G. Fesenkov, Some considerations about the primeval state of the earth, and V. A. Sokolov, The evolution of the earth's atmosphere, both dealing with the as yet uncertain question as to whether the original atmosphere of the earth was in a reduced or oxidized state; J. D. Bernal, The problem of stages in biopoesis; B. J. Levin, Formation of the earth from cold matter and the origin of primitive organic compounds, a defence of the theory that the earth was initially cold and that complex organic compounds were present from the beginning; P. N. Krapotkin, The geological conditions for the appearance of life on the earth, and the problem of petroleum genesis, a powerful statement of the arguments in favour of an inorganic origin of petroleum; N. W. Pirie, Chemical diversity and the origin of life, an entertaining development of views already published [XXIV, 2638]; O. Hoffmann-Ostenhof, Der Ursprung der Enzyme [The origin of the enzymes]; J. Bernal, The scale of structural units in biopoesis; F. Cedrangolo, The problem of the origin of proteins, in which *in vitro* synthesis of cocarboxylase is described; L. Nicolaev, Les composés complexes et les modèles des ferments [Complex compounds and enzyme models]; F. Šorm, Ähnlichkeit der Struktur bei Eiweissstoffen [Structural similarity in proteins], a survey of the frequencies of the various types of aminoacid sequences; R. L. M. Synge, The occurrence of aminoacids in nature; A. S. Konikova and M. G. Kritzman, Experimental demonstration of metabolic processes in simple proteins, in which *in vitro* incorporation of isotope-labelled aminoacids in isolated proteins is described; E. Chargaff, Nucleic acids as carriers of biological information, a critical evaluation of the roles of DNA, PNA and protein in information storage and transfer; A. N. Belozersky, On the species specificity of the nucleic acids of bacteria; J. Brachet, Les acides nucléiques et l'origine des protéines [Nucleic acids and the origin of the proteins], a discussion as to which came first, nucleic acids or protein; H. Fraenkel-Conrat, B. A. Singer and R. C. Williams, The nature of the progeny of virus reconstituted from protein and nucleic acid of different strains of tobacco mosaic virus [cf. XXVIII, 1074]; G. Schramm, Die Bedeutung der Virusforschung für die Erkenntis biologischer Vermehrungsvorgänge [The significance of virus research for knowledge of biological reproductive processes], reporting on independent discovery that the RNA from tobacco mosaic virus is capable of infection when the protein component is removed; P. Mitchell, The origin of life and the formation and organising functions of natural membranes, in which the notion of the semi-periodic solid state in connexion with molecular replication is developed; N. M. Sissakian, The role of structural elements in the biochemical function of the cell, chiefly concerned with intracellular localization of biochemical processes; G. A. Deborin, Protein complexes as biochemically active systems, in which examples are given of the effect of complex formation by enzyme proteins on their catalytic activity; R. Khessin, Cell structure and protein synthesis, in which protein synthesis in homogenates is described; A. G. Passynsky, Enzymatic reactions in steady open systems, a kinetic study; A. E. Braunstein, The pathways of biological assimilation and dissimilation of nitrogen and some aspects of their evolution; W. Schaposchnikow, Über einige wahrscheinliche Wege der Evolution des Stoffwechsels bei den Mikroorganismen [On some probable courses of the evolution of metabolism in the microorganisms]; W. L. Kretovich, Le rôle ammoniaque dans l'assimilation autotrophe de l'azote [The role of ammonia in the autotrophic assimilation of nitrogen]; J. Oda, Significance of molecular

hydrogen metabolism in the transition stage from anaerobiosis to aerobiosis; M. Ishimoto and F. Egami, Meaning of nitrate and sulfate reduction in the process of metabolic evolution; B. A. Rubin, Comparative characteristics of oxidation systems of different groups of organisms in relation to evolution, a review of the various oxidase systems; M. Calvin, Chemical evolution and the origin of life, a hypothetical account of the evolution of the major biochemical compounds together with references to some already reported instances of radiation-induced organic synthesis; A. A. Krasnovsky, Development of the mode of action of the photocatalytic system in organisms, in which the role of porphyrins in the evolution of photocatalysis is discussed; C. Reid, Energy traps in primitive photobiological processes, an interesting paper on the possible role of sulphur in the early stages of evolution; Y. I. Sorokin, The evolution of chemosynthesis, in which Oparin's view on the secondary nature of this type of anabolic activity is supported; D. J. Sapozhnikow, Entstehung und Evolution der phototrophen Ernährungsweise [Origin and evolution of the phototrophic mode of nutrition]; and T. N. Godnjev, Die Grundetappen der Biogenese des Chlorophylls [The basic stages in the biogenesis of chlorophyll].

909 Swanson, C. P.
**Cytology and cytogenetics.**
Macmillan & Co. Ltd., London 1958 : 45s. : Pp. x + 596 : figs.

The advances in cytogenetics made in recent years and the lack of an adequate text book on the subject make Professor Swanson's book particularly welcome. The reference to cytology in the title is perhaps slightly misleading, for, except in a single chapter on the generalized cell, only those aspects of general cytology concerned with the nucleus receive attention. This limitation however does not detract from the merits of a book whose main theme is cytogenetics. The contents fall into three parts. The first, covering four chapters, deals with the history of the subject, general cell structure, cell division and syngamy and the chromosome theory of inheritance. In chapters 5 to 12, which form the bulk of the book, detailed consideration is given to various aspects of chromosome structure and behaviour, including spontaneous and induced aberrations, special attention being given to recent experimental studies. The third part, comprising chapters 13 to 17, is concerned with evolution of cytological systems and discusses the role of sex-determining mechanisms, aberrations, polyploidy, apomixis and parthenogenesis in evolution. The book is intended for use at the undergraduate level but can hardly be classed as elementary. The early introductory chapters are in the nature of a summary of some of the basic facts and tenets of genetics and cytology and will probably be found daunting rather than instructive by the student who lacks a good grounding in the subject. But the slightly more advanced student will find it rewarding. It is thorough, detailed, interesting and, on the whole, clearly written, and it contains many excellent line drawings as illustrations; the photographic reproductions are less satisfactory, most of them being rather blurred. Professor Swanson's own interests are botanical rather than zoological, but his book will be as useful to zoologists as to botanists, for he draws his many examples from both plant and animal kingdom, and refers to many organisms other than the ever popular maize and *Drosophila*. The author's interests, however, do impose some limitations. His chapter on the chemistry of nuclei and chromosomes, for example, is remarkably short, and he dismisses cytoplasmic inheritance in one page. But with its excellent accounts of work and hypotheses on crossing over and chiasma formation (Professor Swanson tends to favour the Belling hypothesis rather than Darlington's theory), of research on chromosomal aberrations and of the bearing of cytogenetics on evolutionary studies, together with its detailed bibliography and efficient index, this volume forms a valuable addition to the text books on cytology and genetics.

910 Ruhland, W. (Editor)
Handbuch der Pflanzenphysiologie.
**Encyclopedia of plant physiology.**
Springer-Verlag, Berlin 1958 : **4** : DM 298 : Pp. xx + 1210 : 217 figs. : tables.

The field covered by this large encyclopedia has already been outlined in a review of the first volume [XXVI, p. 525]. Volume IV is the second of a series dealing with metabolism; this series forms Part II of the encyclopedia. As in the first volume, some of the contributions are in English and others in German, there being no summaries in the alternative languages.

This volume is divided into sections dealing with the following subjects: Die Aschenstoffe [The ash]; Methoden zur Ermittlung mineralischer Bedürfnisse der Pflanzen [Methods for determining the mineral requirements of plants]; Der Erwerb der Mineralstoffe [The acquisition

of minerals]; Der Transport der Mineralstoffe [The transport of minerals]; Der Haushalt der Mineralstoffe [The metabolism of minerals]; Salt losses and redistribution of salts in higher plants; Die Bedeutung der Mineralstoffe für die pflanzliche Besiedlung des Bodens [The significance of minerals for the vegetative colonization of the soil]; Die mineralischen Nährstoffe im Pflanzenbau [Mineral nutrients in the cultivation of plants] and Die Bedeutung der Mikroorganismen für den Kreislauf der Mineralstoffe [The significance of microorganisms for the mineral cycle].

Each section contains one or more essays by experts in the respective subjects, the general level of presentation being of a high standard; an extensive bibliography follows each essay. An author index and subject indexes in English and German are also provided.

911 Crafts, A. S., Machlis, L. & Torrey, J. G. (Editors)
**Annual review of plant physiology. Vol. 9.**
Annual Reviews, Inc. Palo Alto, California 1958 : $7.50 : Pp. 510 : figs. : tables.

Among the fifteen contributions forming the present volume are several having some bearing on plant breeding. Readers concerned with breeding plants tolerant of saline conditions are likely to be interested in the paper entitled Physiology of salt tolerance, in which L. Bernstein and H. E. Hayward cite much evidence supporting the osmotic inhibition theory. They also consider the influence on plant growth and yield of specific ion effects and of the stage of development at which the plant is exposed to saline conditions.

There are several articles on auxins: The naturally-occurring auxins and inhibitors, by J. A. Bentley; Destruction of auxin, by P. M. Ray; and Auxin uses in the control of flowering and fruiting, by A. C. Leopold. In the last-mentioned, observations on the alteration of earliness of flowering, the induction, prevention and delay of flowering and alteration of sex by auxin application are reviewed, together with investigations on auxin effects on fruit set and other characters. E. K. Woodford, K. Holly and C. C. McCready, in Herbicides, mention work showing that translocation of 2,4-D from treated leaves occurs more rapidly in plants susceptible to this herbicide than in resistant plants.

R. A. Steinberg contributes a paper on the Physiology of the tobacco plant, in which he discusses *inter alia* the responses to physical and chemical factors of tobacco and the presence and synthesis of organic metabolites and alkaloids in different *Nicotiana* species.

The remaining contributions are: The quantum yield of photosynthesis by R. Emerson; Metabolism of ascorbic acid in plants: part I. Function, by L. W. Mapson; Mineral nutrition of tree crops, by W. Reuther, T. W. Embleton and W. W. Jones; Physiology of fresh-water algae, by R. W. Krauss; The metabolism of amino acids and proteins in plants, by E. W. Yemm and B. F. Folkes; Morphogenesis in lower plants, by L. F. Jaffe; Postharvest physiology of Fruits, by R. Ulrich; The biogenesis of flavonoids, by L. Bogorad; and Cytochromes in plants, by L. Smith and B. Chance.

912 Bonner, J. T.
**The evolution of development.**
Cambridge University Press 1958 : 17s. 6d. : Pp. vii + 103 : 33 figs.

The three lectures in this volume were originally delivered at University College, London. The theme is development considered as a product of evolution. In the first lecture, development in the Protista is first discussed and then the various ways in which organisms have achieved an increase in size and complexity. Contrasts are drawn between the siphonaceous habit of some algae, the filamentous plant, "growth by aggregation", exemplified in particular by the larger basidiomycetes, and the plasmodial habit of the myxomycetes. The second lecture is principally concerned with embryological systems, which are roughly classified as gradient systems, induction and polarity. In the last lecture, the individual is transcended and a brief survey is presented of sexual differentiation, symbiosis, with special reference to the lichens, and animal sociology.

The author's style and choice of examples are felicitous but the reader is left in some doubt as to what theoretical conclusion, if any, is being upheld. We are admonished on p. 2 that "selection is a supreme and all-important principle which has channelled and governed every aspect of life that exists today" and that "increase in size has, under certain conditions, adaptive value" but nothing substantial in the way of experimental evidence for either of these statements is presented. The author does indeed seem to have some doubts himself on this point as on p. 67 he complains that, in the case of the branched fruiting body of the myxomycete *Polyspondylium*, "the adaptive

advantage seems especially hard to grasp". The general theme of the author that development is a consequence of "sex and size", or more correctly but less euphoniously, "reproduction and size" seems unexceptional, but the general impression remains that development has been characterized rather than explained.

913 Lewis, P.
**British wild flowers.**
Eyre & Spottiswoode, Ltd., London 1958: 25s. : Pp. 376 : 170 figs. : 15 plates.

Meikle, R. D.
**British trees and shrubs.**
Ibid. 1958 : 25s. : Pp. 244 : 84 figs. : 15 plates.

These two attractively designed volumes appear at first sight to belong to the increasingly large number of popular illustrated flower books purporting to enable any plant lover to name, with a minimum of effort, any British plant he may find. The aim of the Kew Series, of which the present volumes are the first two, is rather different. Planned, written and edited by members of the botanical staff of the Royal Botanic Gardens, Kew, the series will comprise five volumes and is intended to provide the beginner with a detailed and systematic guide to British plants and at the same time to give him a grounding in classification which will enable him to proceed to more advanced studies if desired. The plants are described in systematic order according to family, and both scientific and vernacular names are given. The number of technical terms has been kept fairly low, and those that are used are explained either in the introduction or in the glossary.

In each volume, the introduction and a key to the genera are followed by the individual descriptions, which include particulars of habitat, distribution, derivations of the scientific names and such general matters as edibility and economic uses.

Of the two books under review, Mr. Meikle's is the more pleasing. He is knowledgeable about the history and uses of the trees and shrubs he describes, and writes enthusiastically and vividly. Miss Lewis's interests are more purely botanical. Her descriptions are adequate but her general information meagre: in her notes on the Cruciferae she fails even to mention the common vegetable and fodder crops included in the family. Her style is correspondingly pedestrian.

In works of this kind, whatever the limitations or excellences of the text, the popularity will ultimately depend largely on the quality of the illustrations. In the present case the quality is very high. Each volume contains fifteen excellent colour plates by Ann V. Webster and numerous black and white drawings. Here again there is a slight difference between the two volumes, in favour of the second; Miss Webster's technique is more suited to the representation of firm, glossy structures than of delicate or hairy material, so that her illustrations of berried shrubs such as holly and dogwood are generally more successful than those of smaller plants such as ladies' smock. The text illustrations in both books are generally good, but some of those illustrating the first volume are too small and stylized to be satisfactory.

914 Blanchard, J. R. & Ostvold, H.
**Literature of agricultural research.**
University of California Press & Cambridge University Press 1958 : 37s. 6d. : Pp. x + 231.

This useful publication may be described as a master guide to the numerous kinds of guides to the literature on agricultural research. It is the first of a series of bibliographical guides on various subjects whose compilation has been sponsored by the University of California. The literature has been arranged in six sections, respectively devoted to agriculture in general, plant sciences, animal sciences, physical sciences, food and nutrition, and social sciences. The section entitled plant sciences is subdivided into parts dealing with botany, horticulture and agronomy, breeding, pathology, and forestry and forest products. Within the subdivisions of the main sections, reference works have been arranged according to such categories as bibliographies of bibliographies, abstracting journals, bibliographies and indexes, encyclopedias, dictionaries, handbooks, periodical lists, and societies and organizations. Emphasis has naturally been placed on American publications, but an attempt has been made to list foreign works of major importance. Annotations have been provided when the title does not fully indicate the nature of the work.

915 Tempany, H. & Grist, D. H.
**An introduction to tropical agriculture.**
Longmans, Green & Co., London 1958 : 40s. : Pp. xvi + 347 : 6 figs. : 17 plates.

D. H. Grist has completed this textbook begun by Sir Harold Tempany who in the words of the preface "visualised something new in agricultural literature". The innovation is presumably the departure from the familiar

treatment of tropical agriculture as the crops classified according to their uses and the attempt instead to describe the whole field of tropical agriculture. This is done in three parts; firstly the background information on climate, soils, vegetation, systems of agriculture and so on; secondly the actual principles of agriculture in the tropics, including soil fertility matters, soil conservation, pests, diseases, weeds, animal husbandry and the like; thirdly the economic background of marketing, credit, land tenure and land use.

This is indeed a very wide field to cover in 313 pages, including as it does tropical soils, irrigation and drainage, and the organization of research. In addition to the ever present problem of keeping up to date, perplexing problems of condensing must arise. Nevertheless the students, agricultural officers and administrators whom Sir Harold Tempany had in mind will find this book an excellent introduction to tropical agriculture.

The effects of brevity and condensing have been partly overcome by including a list of 211 references: only partly overcome because there is little or no mention in the text of such current problems of importance to administrators and agricultural officers as reform of land tenure as in Kenya, the techniques of extension work and the criticisms of statutory marketing boards as expressed for example by P. T. Bauer. Having got to 211 references would it matter to include a few more to cover not only sources used by the authors but also references for general reading? This might, for example, remedy the omission of the East Africa Royal Commission 1953–1955 Report, of both books by G. B. Masefield and of various FAO publications.

There are some misprints in the list of references, e.g., No. 30 "MCD" should be "CMD"; No. 71 should be P. Gourou; No. 73 should be Greenwood, M. and Hayfron, R. J.

The reviewer is concerned with officers and probationers taking Overseas Services Courses and naturally looks for such things as land tenure reform which are always being discussed. The omissions mentioned are not trivial but should not detract from the great value that those new to the tropics will obtain from this book.

B. J. Silk

916 Rose, J. C.
**Creative gardens.**
Reinhold Publishing Corporation, New York & Chapman & Hall, Ltd., London 1958 : 70s. : Pp. 208 : figs. : plates.

Although the author has called this magnificent book "Creative Gardens", one's first impression is that the gardens he has created have the static quality of architecture rather than the dynamic quality of living, growing plants. A closer study serves to confirm this feeling and adds also a suspicion that he does not particularly care for plants. Certainly there are fewer than one is accustomed to; trees are acceptable but grass is too often replaced by tiles, asphalt, gravel or paving stones and hedges by screens of bamboo or other materials. Many of the plans which include houses leave one in doubt as to where the house stops and the garden begins. The area is treated as a whole, to be lived in, a fascinating concept which the weather in many places too often prohibits and which may conflict with many gardeners' desire for privacy. The whole book, in fact, is written in an American idiom which may mystify many other gardeners who could not afford such gardens if they wanted them. Gone is the idea of a garden as a place to grow plants in, or even to potter in; instead one finds "space organized in terms of use becomes a garden". However, there is much that one cannot argue with, faced with mile after mile of suburbia and housing developments, and one has to recognize the author's genius in dealing with sites which would have daunted any less convinced crusader. We must be grateful, too, for the wealth of plans, photographs and discussion and even more for the wealth of ideas which this most stimulating book contains.

917 Tschermak-Seysenegg, E. von
Leben und Wirken. **(Life and work).**
Verlag Paul Parey, Berlin & Hamburg 1958 : DM 19.80 : Pp. xii + 196 : 30 figs. : 15 plates.

While two of the rediscoverers of Mendel's work were pure botanists, the third, whose biography we have before us, is a plant breeder with a long list of improved varieties to his credit. The biography is a succinctly written account, not only of the author's life, but also of some other notable Central European plant breeders, and contains much information on the author's own breeding work. The book will be an essential source for the history of European plant breeding.

The author started his breeding work after having established a wide range of valuable contacts. He had studied at Vienna and Halle and had visited de Vries in Holland and the Maison Vilmorin in Paris. His rediscovery of

Mendel's work occurred during his examination of the literature in connexion with a dissertation on his own experiments on pea hybridization. The petty jealousies stirred up in respect of the relative priorities of the three rediscoveries are graphically portrayed. Thereafter Tschermak led an industrious life, interspersing his breeding work on many crops with regular attendance at scientific conferences and tours as far afield as the United States and Turkey.

Of particular interest are the short life histories of some other leading plant breeders: E. von Proskowetz, A. von Liebenberg-Zittin, F. Schindler, C. Fruwirth and K. von Rümker. These sketches and the other personal descriptions incidental to the author's own biography are written with keen discernment and frankness. The list of breeders who studied under Tschermak at some time or other includes a remarkably large number of names distinguished in the annals of plant breeding.

Those to whom practical achievements are of greater interest than the personal background will find the account of the author's various breeding programmes of major interest. Separate sections are devoted to the breeding of rye, wheat, barley, oats, legumes, pumpkins and ornamental plants.

918 Braun, H.
Die wichtigsten Krankheiten der Kartoffelknollen. Erkennen, Bedeutung und Bekämpfung. (**The chief diseases of potato tubers. Their recognition, importance and control**).
Verlag Paul Parey, Berlin & Hamburg 1958 : 3rd Ed. : DM 6.80 : Pp. 48 : 66 figs.

Mindful of the extreme importance of the tuber diseases in determining not only the quantity but the quality of the potato crop, the author of this booklet has thought it appropriate to devote the entire work to them. Accurate descriptions and clear illustrations are given of the main ailments of the potato tuber found in Germany. Late blight caused by *Phytophthora infestans* naturally comes first and is followed by diseases caused by *Alternaria solani*, *Phoma* sp., and *Rhizoctonia solani* (*Pellicularia filamentosa*), various bacterial diseases, scab and wart (*Synchytrium endobioticum*). These are followed by various nonparasitic maladies, including frost damage and certain nutritional deficiencies.

919 Eden, T.
**Tea.**
Longmans, Green & Co., London 1958 : 35s. : Pp. xvi + 201 : 21 figs. : 67 plates.

This new volume in the Tropical Agriculture Series aims at, in the author's words, "a descriptive account of the various stages of tea cultivation and manufacture on which to base a discussion of the principles involved". Drawing on his own experience in Ceylon and East Africa and his long interest in the subject the author has achieved his object admirably. At the same time he has produced a readable and well-illustrated book. His style is pleasingly concise without being at all dull and the black and white photographs, of which there are over 60, combine clarity with, in many cases, artistic merit. It is a pity that several of the six colour pictures are not of the same high standard. The subject matter is dealt with in fifteen chapters; the development of tea culture, climate and soils, botanical characteristics, planting material, preparation of land and planting, pruning and plucking, cultivation and weeds, manuring, shade and green manuring, diseases and their control, insect and other pests, the chemistry of the tea leaf and of its manufacture, tea manufacture, the tea trade and industry and statistical review. Tea breeding is hardly mentioned. An index completes the book. As well as mentioning past and present progress and changes the author also indicates areas in which further research might be profitable and it is to be hoped that his interesting book will inspire others to enter this field.

920 9e beschrijvende rassenlijst voor fruitgewassen, 1958. (**Ninth descriptive variety list of fruit crops, 1958**).
Inst. Vered. Tuinbouwgewassen, Wageningen 1958 : f. 2.00 : Pp. 128 : figs. : tables : 1 map.

With its detailed descriptions of established and promising new varieties of pome and stone fruits, bush fruits, grape and certain nuts, the present edition of this guide to fruit varieties available in the Netherlands is as useful as ever [cf. XXVII, p. 399]. The descriptions of strawberries, apples and pears are illustrated with line drawings showing the characteristic features of the fruits, and for many crops diagrams of flowering time, ripening period and storage capacity accompany the text. Chapters on soil and climatic requirements in fruit cultivation precede the descriptive section and include maps of soil types and climatic regions in the Netherlands.

921 BANGA, O. (Editor)
11e beschrijvende rassenlijst voor groentegewassen 1959. (**Eleventh descriptive variety list of vegetables, 1959**).
Inst. Vered. Tuinbouwgewassen, Wageningen 1958 : f. 2.00 : Pp. 150 : figs. : tables.

Pleasant to handle, informative and accurate, this new edition maintains the standard set by its predecessors [cf. XXVIII, 3605] and like them lists and describes all the varieties recommended to growers in the Netherlands. All the main vegetable crops are covered and also strawberry, tobacco and vegetables such as purslane and scorzonera, which are less well-known. The section on medicinal and culinary herbs included in previous editions is omitted.

# INDEX


Aalders, L. E., 827
Abdul Hameed Khan, 509
Abramides, E., 693
Adams, J. N., 75
Ajvazjan, P. K., 732
Akeley, R., *see* Akeley, R. V.
Akeley, R. V., 465, 478
Aldrovandi, A., 540
Aleksandrov, S. V., 826
Alfoldi, L., 70
Ali, S. I., 459
Alihanjan, S. I., 87, 885, 889
Allen, D. D., 9
Allen, M. W., 436
Ando, A., 385
Andreev, L. N., 271
Andrews, J. E., 292
Andrukovič, V. I., 432
Antonelli, C., 540
Antunes Filho, H., 573–5
Argikar, G. P., 881
Armstrong, J. M., 428
Arnon, Y., 377
Arora, C. M., 602
Arruda, H. V. de, 854
Artemenko, J. I., 841
Artschwager, E., 549
Asada, S., 785
Ashkenazi, I., 408
Ashton, D. H., 766
Astaurov, B. L., 117
Astrov, A. V., 61
Aswathanarayana, N. V., 897
Atabekova, A. I., 449, 451, 878
Atal, C. K., 608, 888
Atkins, I. M., 170, 187
Atwood, K. C., 136
Avaljan, L. M., 838
Åvall, H., 789
Avila, A., 290

Bachteev, F. C., *see* Bahteev, F. H.
Baggett, J. R., 861
Bahn, E., 29
Bahteev, F. H., 51–2
Bailey, C. H., 678
Bain, D. C., 236
Baird, G. B., 434
Baldini, E., 663
Ballard, J. C., 866
Banajtis, Ju. I., 644
Bandlow, G., 365
Banfi, A., 684
Banga, O., 620, 921
Banič, S., 81
Banneick, A., 29
Bannister, M. H., 776–7
Barak, D., 672
Barbacki, S., 161
Barham, W. S., 817, 820, 825
Barnes, B. V., 757
Barnet, S. A., 907
Barrett, H. C., 730
Bashaw, E. C., 171, 418
Basso, M., 701
Batikjan, G. G., 337
Bawden, F. C., 151, 570
Beddows, A. R., 153, 405
Belcher, B. A., 530
Belova, O. D., 492
Bell, G. D. H., 353
Bell, M. E., 350
Bendelow, V. M., 361
Bergh, B. O., 707
Berkovits, Y., 377
Berkowitz, J., *see* Berkovits, Y.
Berštejn, B. I., 646
Bether, F., 472
Bevan, E. A., 891
Blanchard, J. R., 914
Blasse, W., 668
Blessin, C. W., 379
Blinkenberg, C., 761
Bhattacharyya, N. K., 601
Białobrzeska, M., 762
Bird, L. S., 235, 240
Bjurman, B., 267
Blackmon, C. W., 234
Blickenstaff, J., 344
Bocanegra S., S., 862
Bockmann, H., 300
Böhme, H., 72
Böjtös, Z., 429
Bolonjaev, A., 642
Bolsunov, I., 613
Bonciarelli, D. F., 539
Bonde, R., 465
Bonner, J. T., 912
Bonvicini, M., 832
Bordeianu, T., 632
Bordukova, M. V., 492
Borojević, S., 321, 324
Bourdeau, P. F., 778
Braak, J. P., 791
Bradley, R. A., 17
Bradley, S. G., 83
Bradshaw, A. D., 409
Braun, H., 918
Brazzel, J. R., 517
Brejcha, V., 887
Brejnev, *see* Brežnev
Brenna, H. K., 874
Bresch, C., 57
Brewbaker, H. E., 549
Brežnev, D. D., 611
Brix, H., 761
Bromfield, K. R., 308
Brooks, H. J., 675
Brown, J. J., 508
Brown, R. T., 799
Brown V., L., 862
Brown, W. L., 172
Browne, E. B., 182, 223
Bruner, G. H., 289
Bryner, C. S., 371
Bubnovskij, N. D., 552
Buckner, R. C., 173
Buishand, T., 809
Bukasov, S. M., 244
Buker, R. J., 174
Bulmer, M. G., 7
Burger, O. J., 438
Burns, R. E., 239
Burns, V. W., 108
Burštejn, A. N., 738
Burton, G. W., 175
Busch, L. V., 831

Caldwell, R. M., 257
Cameron, D. R., 569
Camus, A., 410
Canecchio Filho, V., 693–5
Čanev, K., 518
Cárdenas, M., 470
Carlisle, A., 779
Carlson, I. T., 423
Carmon, J. L., 182
Čaročkin, M. M., 708
Carr, J. G., 884
Carter, G. S., 906
Carvalho, A., 573–6
Celarier, R. P., 421
Chant, S. R., 560
Chapman, V., 268
Chapman, W. H., 335
Chargaff, E., 122
Chládek, M., 605
Chopinet, R., 638
Ciasca, L., 735
Cizin, S. G., 558
Clark, R. V., 366
Clautrier, M., 616
Clayton, E. E., 568
Cleland, R. E., 176
Clifford Cohen, A. (Jun.), 2
Conti, S. F., 898
Crafts, A. S., 911
Crane, P. L., 336
Creech, R. G., 178
Crews, J. W., 223
Crowder, L. V., 434
Crowley, A. J., 179
Crossa-Raynaud, P., 629
Cochran, W. G., 10
Cociu, V., 630–1
Cockerham, C. C., 177, 202
Coffindaffer, B. L., 438
Čolahjan, D. P., 337
Coleman, R. E., 535
Colhoun, J., 802
Collins, F. I., 869
Collins, W. K., 194
Comstock, R. E., 351
Comuzzi, A., 736
Conagin, A., 694
Converse, R. H., 725
Coons, I., 16
Cooper, J. P., 45, 154, 414
Corner, E. J. H., 98
Corrales M., A., 796
Corsten, L. C. A., 6
Cosmo, I., 727, 736
Cotter, R. U., 255, 318
Cowie, D. B., 105
Cox, D. R., 20
Cravioto, R. O., 860
Curnow, R. N., 22
Curtiss, R., 127
Culaja, V. I., 685
Cupcinenco, I., 632
Cybul'ko, V. S., 280

Daniels, N. E., 208
Danil'čuk, P. V., 372
Dantuma, G., 253
Darby, L. A., 36, 822
Darmer, G., 741
Daskaloff, C., *see* Daskalov, H.
Daskalov, H., 612
Davidson, D., 133
Davies, W. E., 155
Davis, R. L., 174, 197
Deatherage, W. L., 347
de Haan, H., 149
Del Gaudio, S., 733–5
Demaree, K. D., 232
Dermen, H., 731
de Serres, F. J. (Jun.), 90
Deshmukh, N. Y., 593
Dewey, D. R., 427
Deysson, G., 128, 131
deZeeuw, D. J., 866
Diachun, S., 190, 441
Dibrova, P. A., 651
Dickson, J. G., 205, 366
Dickson, M. H., 792
Dierks, W., 60
Diller, J. D., 753
Din, I., *see* Ting, Y.
Dionne, L. A., 466
Dixon, G. E., 252, 303
Dodge, J. C., 243
Dolphin, G. W., 135
Donà dalle Rose, A., 546
Dongo D., S., 862
Donovan, L. S., 455
Dorst, J. C., 32
Doudney, C. O., 109
Dovrath, *see* Dovrat
Dovrat, A., 430
Dowrick, G. J., 37
Doxtator, C. W., 544
Drain, B. D., 228
Driver, C. M., 489
Duarte, L. S. do N., 340
Dubinin, N. P., 84
Duffield, J. W., 747
Duka, S. H., 719
Dunkelman, P. H., 530
Dunne, J. P., 461
Durrieu-Vabre, 771
Dwyer, J. D., 130
Džangalieva, S., 667

Easton, G. D., 467
Ebert, D., 30
Eddy, A. A., 894
Eden, T., 919
Edgar, R. S., 58
Egorova, G. N., 645
Ehrenberg, L., 115
El-Damaty, A. H., 598
El Hattab, H. S., 333, 339
Elliott, F. C., 505, 904
Elliott, G., 43
Emery, D. A., 180
Erohina, L. I., 87
Eto, T., 529
Etoo, *see* Eto
Evans, H. J., 110
Evdokimov, M. N., 790
Evtušenko, A. F., 739

Fairfield Smith, H., 3, 11
Falkowski, M., 439
Feder, W. A., 681–3
Federer, W. T., 13
Fergus, E. N., 173
Ferguson, J. H. A., 145
Feinbrun, N., 606
Fejer, S. O., 181
Ferré, Y. de, 755
Filippov, A. S., 482
Filosofova, T. P., 720
Filutowicz, A., 250
Fincham, J. R. S., 47
Finney, D. J., 15, 44
Finkner, R. E., 544
Fiori, L. A., 508
Fiorito, G., 671
Fisher, R. A., 79
Fleming, A. A., 182, 222–3
Flint, F. F., 119
Flor, H. H., 521
Forbes, I. (Jun.), 418
Ford, H. W., 681–2
Foote, W. H., 203
Fowler, D. P., 781
Frakes, R. V., 183
Frankel, O. H., 184
Franklin, D. F., 797
Fraser, A. S., 185
Frazier, W. A., 861
Frecha, J. H., 367–8
Fredericq, P., 69
Freitas, A. P. do C. e, 305
French, S. A. W., 364
Frey, K. J., 186
Frolov, I. T., 92
Fröst, S., 139
Fryxell, P. A., 507
Furness, G., 55
Furr, R. E., 226
Futrell, M. C., 187, 307
Futsuhara, Y., 381

Gabriel, W. J., 743, 775
Gačinskij, E., 551
Galindo, J., 468
Gallarate, G., 541–2
Gallegly, M. E., 468
Galun, E., 614
Gardner, C. O., 196
Garkavyj, P. F., 362, 373
Garrett, W. N., 307
Gause, G. F., 85
Gawad, S. A., 288
Gedz', S. M., 494
Geidel, H., 23–4
Geis, J. R., 307
Generalov, G. F., 852
Genesan, A. T., 902
Giacomini, V., 310
Giardini, A., 540
Gibbs, R. D., 99
Gilbert, N., 36
Gilbert, J. C., 851, 877
Gillett, J. B., 458
Gillissen, G., 74
Girotto, G., 540
Gladstones, J. S., 447
Goetze, N. R., 221
Gol'dat, S. Ju., 885

González B., J., 862
Goplen, B. P., 436
Gori, C., 137
Gorjunov, D. V., 61
Gorobec, A. M., 848
Gotoh, K., 354
Gouchtchine, M. Y., *see* Guščin, M. J.
Govinda Iyer, T. A., 33
Grafius, J. E., 188
Grassel, C. O., 530
Gray, G. E. J., 94
Green, G. J., 306
Greene, J. T., 227
Greer, S., *see* Greer, S. B.
Greer, S. B., 88–9
Gricenko, R. I., 374
Griffiths, D. J., 156, 317
Grihutik, M. I., 476
Grinčenko, I. F., 554
Grist, D. H., 915
Gröger, D., 886
Groszmann, A., 340
Gursham Singh, 590
Guščin, M. J., 626
Gustafsson, Å., 115

Haas, F. L., 109
Habeck, J. R., 773
Habermann, H. M., 600
Hadžinov, M. I., 327
Hagiwara, A., 56
Hagiya, K., 793
Hamilton, L. D., 121
Hansen, J. E., 427
Hanson, C. H., 193
Harada, S., 571
Harris, R. H., 289
Harston, C. B., 242
Hart, R. H., 189
Hartley, H. O., 5
Hartley, W., 419
Harvey, P. H., 344
Hashimoto, T., 898
Hassan Ahmed Azzam, 863
Hatheway, W. H., 18
Hawkes, J. G., 481
Hawthorne, D. C., 890
Hawthorne, P. L., 230
Hayase, H., 819
Hayman, B. I., 54
Heimburger, C., 749, 781
Hein, M. A., 402
Heine-Geldern, R., 107, 511
Henderson, M. T., 200, 217
Henson, L., 190, 441
Henmi, *see* Hemmi, 806
Hemmi, S., 806
Henze, J., 633
Heyland, K. U., 315
Heyne, E. G., 278
Hill, R. F., 82
Hintze, S., 789
Hirai, G., 503
Hirose, T., 584–5
Hižnjak, P. A., 493
Hollowell, E. A., 454
Holt, E. C., 171
Holzer, K., 774
Horák, P., 887

Horesh, A., 338
Horn, N. L. (Jun.), 230
Horner, E. S., 335
Horrell, C. R., 401
Hosokawa, S., 543
Hougas, R. W., 467
Hough, L. F., 675, 678
Hovin, A. W., 406
Howell, N. A., 508
Howland, A. K., 348
Hoyle, B. J., 363
Hubbeling, N., 624
Hughes, C., 132
Hughes, I. M., 78
Huxley, J., 97
Hvostova, V. V., 311
Hwang, S. L., 800
Hyde, B. B., 125
Hylander, H., 711

Ikeda, Y., 899
Il'enko, G. T., 323
Illies, Z. M., 783
Ipat'ev, A. N., 845
Ishibashi, K., 313
Isoda, R., 462
Ito, M., 828
Ito, S., 657
Ivanov, N. D., 104
Iyer, V. N., 86

Jacob, F., 46, 48, 62, 70
Jähnl, G., 463
Jain, H. K., 415
Jakuhina, A. F., 326
James, E., 224
Janaki Ammal, E. K., 703
Jánossy, A., 330
Jenkins, B. C., 191
Jenkins, J. N., 192
Jensen, V. S., 744
Jinks, J. L., 59
Joglekar, R. G., 593
Joham, H. E., 240
Johansen, D. A., 119
Johnson, L. P. V., 358
Johnson, V. A., 170
Johnston, W. H., 361
Jones, A., 193
Jones, F. G. W., 152
Jones, G. L., 194
Jones, K., 157, 425
Jones, L. I., 405
Jones, R. M., 59
Joshi, A. B., 378
Joubert, T. G. la G., 876
Joyner, J. F., 525
Jucci, C., 615
Judin, B. F., 345
Jugenheimer, R. W., 179, 195

Kamimura, S., 805
Kacen, D. G., 583
Kadamov, S. K., 422
Kajiura, M., 674
Kamal, M. A. M., 286–8, 598
Kapitonova, O. N., 87
Kato, I., 868
Katsuo, K., 383
Katzenberger, W., 444, 873
Katznelson, J., 442
Kawahara, M., 868
Kawakami, K., 471
Kaz'min, G. T., 669
Kehr, A. E., 799
Kehr, W. R., 196
Kelleher, T., 351
Kempanna, C., 453
Khan, A. H., 578
Khem Singh Gill, 590, 594
Kho, Y. O., 791
Kiellander, C. L., 784
Kilkarni, S. N., 595
Kimura, S., 384
Kinš, A. S., 326
Kintzley, J. P., 548
Király, Z., 302
Kirby-Smith, J. S., 135
Kiričenko, F. J., 262
Kishi, K., 813
Kiss, F., 641
Kizima, P. N., 285
Klein, D. T., 126
Kleinschmidt, G., 579
Klug, R. J., 522
Kneebone, W. R., 420
Kynš, A. N., 829–30
Kobendza, R., 765
Kobori, O., 382
Kocwa, E., 893
Koedžikov, H., 274
Koehler, F. E., 445
Kohel, R. J., 197
Köhler, D., 524
Kohoutová, M., 73
Kokubun, K., 273
Koldanov, V. Ja., 754
Kølmark, G., 111
Komarova, E. S., 729
Komlóssy, Gy., 483
Kono, M., 528
Kononkov, P. F., 846
Konsler, T. R., 817
Kopilovič, O. I., 814
Kovács, S., 246, 718
Kozelnicky, G. M., 182, 222–3
Kozłowska, A., 500
Kraevoj, S. Ja., 837
Kramer, H. H., 178, 192
Kramer, S., 655
Krasnoperova, A. E., 653
Krimbas, B., 740
Kronenberg, H. G., 721
Krouch, E. D., 548
Krutenko, E. G., 309
Kudrnáč, S., 887
Kühn, H., 496
Kujat, F. F., 835
Kunitomi, M., 313
Küppers-Sonnenberg, G. A., 795
Kuriyama, H., 397
Kurosawa, T., 871
Kuždowicz, A., 250
Kuznecov, A., 168
Kybal, J., 887

Lachman, W. H., 9
La Cour, L. F., 120
Lamb, C. A., 219
Lamm, R., 789
Lanza, F., 867
Lapčenko, G. D., 270
Larson, R. H., 467
Latypov, A. G., 883
Lauber, J.-H., 676
Laude, H. M., 218
Laurila, K., 469
Lederberg, J., 105
Lee, W. R., 714
Lelley, J., 254
Leplinskaja, A. A., 658
Lerner, I. M., 905
Lesley, J. W., 847
Lesley, M. M., 847
Leszozakówna, B., 588
Levine, M., 127
Lewis, P., 913
Ležepekov, S. A., 482
Lhuillier, J., 510
Li, H. W., 198
Lima-de-Faria, A., 199
Lin, C.-I., 393
Lindegren, C. C., 892, 900
Lindley, D. V., 1
Linev, P. S., 843
Link, C. B., 53
Lipinski, S., 486
Lipsic, D. V., 647
Lisavenko, M. A., 712
Little, H. W., 508
Ljaščenko, I. F., 599
Lloyd, E. P., 226
Lo, Y.-W., 526
Loladze, V. R., 728
Lorenzo, J. R., 513
Lowe, A. E., 220
Lubenec, P. A., 431
Luce, B., 652
Lucka, M., 635
Luckwill, L. C., 627
Luippold, H. E., 136
Lukpanov, Ž., 567
Lunden, A. P., 464
Lundqvist, A., 325
Lundy, H. W., 335
Luria, S. E., 75
Lysogorov, N. V., 118

McGuire, D. C., 851
Machlis, L., 911
McKeen, W. E., 724
McManus, A. A., 130
MacMasters, M. M., 347
Maierhofer, E., 480
Maksakova, V. M., 839
Malinowski, B., 588
Malygin, Ju. N., 106, 164
Mandel, S. P. H., 78
Manner, R., 591
Mansurova, V. V., 311
Marciotte, C. V., 520
Marden, J. A., 560
Marinič, P. E., 163
Marshall, H. H., 849
Martin, D. F., 517
Marvin, D. A., 121
Mashima, J., 391
Masima, *see* Mashima
Mason, L., 200
Massieu, G. H., 860
Matsubayashi, M., 471

Matsui, S., 657
Matsumoto, S., 871
Matsuo, T., 385
Matsushima, J., 679
Matthews, L. H., 100
Matveev, N. D., 523
Matzinger, D. F., 194
Maunder, A. B., 201
Maze, R., 70
Mazumdar, S., 34
Meier, G., 648
Meikle, R. D., 913
Mel'nik, S. A., 737
Menzel, M. Y., 527
Meredith, W. O. S., 361
Merh, J. L., 595
Merkl, M. E., 226
Merriam, D., 465
Merrill, S. (Jun.), 596
Meselson, M., 124
Mestenhauser, A., 605
Mészöly, Gy., 246
Michaelis, A., 853
Michaelis, P., 76, 77
Michelin, A., 434
Michelson, L. F., 9
Micke, A., 446
Mikaelsen, K., 112
Mikhaĭlov, V. P., 116
Mil'čin, M. I., 787
Milella, A., 686
Miles, S. R., 336
Miller, J. C., 230, 799
Milovidov, P., 604
Mirov, N. T., 780
Miščenko, O. H., 670
Mital, S. P., 378
Mitra, G. N., 398
Mitsukuri, Y., 801
Mizushima, U., 383
Möbius, H., 29
Mochizuki, A., 356, 412
Mode, C. J., 80
Mohácsi, T., 592
Mohov, V., 816
Moll, R. H., 202
Møller Nielsen, H., 433
Monod, J., 46
Moore, J. F., 856
Mordašev, G. S., 556
Moreno, O., 857
Morinaga, T., 397
Morley, F. H. W., 184
Morris, R., 134
Morrison, K. J., 242
Mortimer, R. K., 140
Mothes, K., 579
Moutschen, J., 113
Moutschen-Dahmen, J., 138
Moutschen-Dahmen, M., 138
Mukade, K., 273
Mukherjee, S. K., 690
Müller, K.-H., 27, 29
Müntzing, A., 147
Murata, N., 657
Murphy, R. P., 413

Nagaeva, N. P., 821
Nagai, H., 900
Nagai, S., 900
Nagamatsu, T., 396
Naguib, M. I., 286–7
Nai Prayote Purnasiri, 504
Naito, Y., 868
Nakagawa, H., 805–6
Nakagawa, M., 259–60, 295–99
Nakahira, K., 529
Nakajima, G., 266
Nakajima, T., 148
Nakayama, A., 571
Nakayama, K., 603
Nandpuri, K. S., 203
Naylor, H. B., 898
Neary, G. J., 110
Nico, G., 733–4
Nielsen, E. L., 204–5
Nienstaedt, H., 752
Nieuwhof, M., 807
Nikolaeva, M. G., 767
Niles, G. A., 505
Niles, J. J., 395
Nilsson, B., 782
Nishimura, S., 772
Nishio, K., 259–60
Nishiura, M., 679
Nitočkina, A. P., 715
Nover, I., 365
Nusbaum, C. J., 237
Nuždin, N. I., 68
Nybom, N., 610

Oakes, A. J., 699
Ohara, S., 586
Okanenko, A. S., 646
Okudai, N., 679
Okura, E., 528
Oldemeyer, R. K., 547, 555
O'Loughlin, G. T., 443
Omura, T., 396
Onozawa, Y., 688, 689
Oparin, A., 908
O'Rourke, E. N. (Jun.), 229
Ortega, D. A., 531
Ortlepp, H., 28, 29
Oshima, N., 501
Östergren, G., 134
Ostvold, H., 914
O'Sullivan, T. J. R., 461
Ottosson, L., 879
Ovčinnikov, B. F., 399
Owen, H. E. (Jun.), 786

Paliwal, R. L., 125
Palocsay, R., 617
Pandele, I., 630–2
Panella, A., 435
Pantjuhina, L. A., 487
Pap, E., 246
Papavassiliou, J., 69
Papp, Zs., 304
Pardee, A. B., 46
Parrish, M. J., 141
Parthasarathi, K., 534
Paškar', S. I., 647
Patau, K., 798
Pate, J. B., 525, 527
Pateman, J. A., 47
Patil, R. P., 457
Patton, R. F., 751
Pawlisch, P. E., 206
Pearce, S. C., 8
Pecaut, P., 621
Peck, N. H., 850
Pehov, A. P., 118
Pelc, S. R., 120
Pelissier, P., 692
Pelton, J. S., 328
Pergament, E., 207
Perkins, D. Y., 799
Peterson, C. E., 792
Petrahilev, I. M., 709–10
Petruccioli, G., 702
Pettersson, M. L. R., 94
Pfrimmer, T. R., 226
Phillipp, L., 281
Pickett, R. C., 201, 221
Pieniazek, *see* Pieniążek
Pieniążek, S. A., 660
Pinthus, M., 597
Pisarenko, G. S., 275
Pisarev, V. E., 258, 269
Pittman, D. D., 892
Piunovskij, I. M., 319
Pollack, B. L., 834, 882
Polster, H., 759
Pontecorvo, G., 101
Popescou, C. T., 855
Popov, N. N., 738
Popova, E. M., 804
Popova, I. V., 557
Porpáczy, A., 246
Porter, H. L. (Jun.), 417
Porter, K. B., 208
Potapov, S. P., 715
Powell, N. T., 237
Powers, L., 544
Preston, W. H. (Jun.), 53
Prévost, N., 129
Prjanišnikova, E. N., 497
Procenko, D. E., 484
Prokof'eva-Bel'govskaja, A. A., 87
Pruckova, M. G., 164
Pumphrey, F. V., 445
Purss, G. S., 865

Quackenbush, F. W., 833
Quevedo Díaz, A., 490

Raghavan, R. S., 561
Rajháthy, T., 254
Ramachandran, N., 589
Raman, V. S., 696–7
Randolph, L. F., 411
Randolph, M. L., 136
Rappaport, H. P., 71
Rawlings, J. O., 214
Rebenfeld, L., 512
Reese, G., 143
Refai, F. Y., 286–8
Reichenbach, H., 759
Reinbergs, E., 356
Reissig, J. L., 42
Reitz, L. P., 170
Rejngard, T. A., 647
Ribaldi, M., 435
Richens, R. H., 764
Richmond, T. R., 505

Rick, C. M., 209
Rieger, R., 144, 853
Righter, F. I., 748
Riker, A. J., 751
Riley, R., 40, 268
Roberts, B. J., 255
Robertson, A., 95
Robinson, H. F., 202, 351
Roché, B., 242
Roer, L., 464
Roper, J. A., 39
Roščupkina, S. V., 713
Rose, J. C., 916
Rosen, G. von, 875
Rosen, H. R., 233
Ross, J. M., 637
Ross, W. M., 376
Roujitza, G., 618
Royan, S., 895
Rozganova, V. N., 331
Rudkovskij, G. P., 677
Rudolf, P. O., 745, 752
Ruebenbauer, T., 320, 342
Ruhland, W., 910
Rybin, V. A., 628
Rybin, W. A., *see* Rybin, V. A.
Ryder, E. J., 864
Ryžej, I. P., 284

Sagajdak, I. N., 359
Saharov, V. V., 311
Saito, H., 899
Saito, T., 828
Sakai, K., 395
Säkö, J., 656
Samoto, K., 394
Sampson, D. R., 808
Sands, J. E., 508
Sanz de Cortázar, C., 479
Sapin, P., 559
Sapko, D. D., 580
Sardi, F., 736
Sasaki, S., 717
Sastry, K. S. K., 453
Sato, H., 391
Sato, I., 805
Sato, T., 717
Satyabalan, K., 700
Saura, F., 279
Savage, R. R., 347
Savitsky, V. F., 550
Sawant, A. C., 704–5
Scarascia, G. T., 35, 249, 566
Schaffalitzky de Muckadell, M., 761
Schairer, L. A., 114
Schaller, C. W., 210
Schertz, K. F., 411, 413
Schiemann, E., 272, 723
Schnee, M., 30
Schnell, F. W., 211
Schopmeyer, C. S., 778
Schreiber, F., 623
Schreiner, E. J., 750, 756
Schultes, R. E., 577
Schulz, K., 450
Schulze, J., 25
Schumann, D. E., 17
Schwarting, A. E., 888
Schwemmle, J., 146
Scossiroli, R. E., 35
Scott, D. H., 725
Sedlmayr, K., 545
Šeftel', I. M., 685
Seitz, F. W., 758
Seko, H., 394
Sen, P. K., 398
Senn, E., 510
Senti, F. R., 347
Sentz, J. C., 212
Serra, J. A., 63–7
Seshadri, C. R., 587
Shakudo, K., 382
Shands, H. L., 206
Sharma, A. K., 601
Shibata, K., 803
Shibutani, S., 462
Shidei, T., 769
Shinohara, K., 582
Shinozaki, Y., 586
Sibbitt, L. D., 289
Sigurbjörnsson, B., 412
Sillitto, G. P., 21
Simonet, M., 263
Singh, D., 698
Singh, D. N., 698
Singh, H. G., 219
Sin'kova, Z. A., 716
Sistrunk, W. A., 230, 861
Skaare, S., 440
Skripnikov, Ju. G., 818
Šmal'gauzen, I. I., 93
Smirnov, N. A., 823
Smith, P. G., 811
Smith, W. K., 180
Sneep, J., 619, 810
Snyder, J. C., 243
Sokolovskaja, A. P., 142
Soltanovskaja, G. A., 840
Sozinov, A. A., 362
Sparrow, A. H., 114
Spasojević, V., 343
Specht, G., 26
Spencer, M., 121
Spragg, S. P., 132
Srinivasachar, D., 798
Srinivasalu, N., 589
Ssu, C.-M., 526
Stahl, F. W., 124
Stanford, E. H., 213, 218, 436
Starlinger, P., 57
Staudt, G., 272
Stehouwer, J. H., 607
Steikhardt, H., 444, 873
Steineck, O., 502
Steinman, I. D., 86
Stewart, D. M., 255, 318
Štorchová, J., 604
Storey, H. H., 348
Stottmeister, W., 498–9
Strachan, C., 622
Strusi, A., 283
Stuart, A., 4
Styckers, J., 251
Štyrlov, A., 537
Suárez-Soto, L. M., 860
Subbioni, F., 702
Subramaniam, M. K., 897
Suda, Y., 768
Sudnov, P. E., 247
Sugahara, Y., 722
Sugawara, K., 312
Sugimoto, K., 394
Šulyndin, A. F., 294
Šumanskaja, M. G., 836
Summers, T. E., 527
Sundara Raghavan, R., 602, 703
Suneson, C. A., 363
Suzuki, I., 722
Sváb, J., 31
Sváb, J. (Mrs), 448
Švorneva, A. M., 815
Swaminathan, M. S., 902
Swanson, C. P., 909
Swink, J. F., 544
Sy, *see* Ssu
Syakudo, *see* Shakudo
Sybenga, J., 322
Sylvain, P. G., 572
Szybalski, W., 86

Tabidze, D. I., 726
Takahashi, T., 899
Takakuwa, M., 488
Takashima, S., 584
Takeda, T., 543
Tamai, T., 582
Tanaka, H., 313
Tanaka, J., 851
Tang, C.-Y., 680
Taniguchi, R., 868
Tapay, J. T., 532
Tapley, W. T., 850
Tasaki, J., 858
Taubeneck, U., 72
Taylor, A. R., 358
Taylor, D. K., 301
Taylor, M., 225
Taylor, R. D., 548
Teixeira, C. G., 901
Tella, R. de, 693–5
Tempany, H., 915
Tereščenko, E. F., 495
Teterjatnik, A. F., 885
Thomas, H. H., 102
Thompson, D. L., 214, 344
Thompson, J. B., 291
Thorne, G. N., 150, 364
Thorpe, H. C., 252, 303
Thurman, R. L., 225
Thyagarajan, T. R., 896
Tims, E. C., 799
Ting, Y., 390
Toda, R., 770
Todaka, S., 722
Tokumasu, S., 582
Toledo, O. Z. de, 901
Tomes, M. L., 833
Tomiyama, K., 488
Toriyama, K., 381
Torrellas G., A., 531
Torrey, J. G., 911
Tóth, E., 665
Townsend, C. E., 215
Toxopeus, H. J., 491
Tozu, T., 264
Trébuchet, M., 639
Troll, H. J., 452
Truhaut, R., 128, 131
Truscott, J. D., 412
Tschermak-Seysenegg, E. von, 917
Tsuchiya, T., 357
Tucker, S., 256

Tuite, J. F., 256
Turrill, W. B., 103
Tuz, A. S., 691

Uchiyamada, H., 391
Udvaros, K., 254
Ukita, S., 584
Ukolov, A. A., 276
Ul'janiščev, M. M., 662
Ul'janiščeva, A. M., 661
Unrau, J., 41
Ustimenko, G. V., 794

Valjura, V. I., 341
Valle Ribeiro, M. A. M. do, 291
van den Ende, G., 760
van Dessel, M., 844
VanEtten, C. H., 379
van Os, F. H. L., 607
Varenica, E. T., 282, 373
Vasil'ev, A. F., 564–5
Vasil'ev, V. N., 763
Vavilov, N. I., 51–2
Vedel, H., 761
Vernazza, N., 581
Vestad, R., 440
Viehmeyer, G., 96
Vigorov, L. I., 654
Vijayasaradhy, M., 534
Vinogradova, N. M., 314
Virgin, W. P., 512
Vishnu Swarup, 378
Vitkovskij, V. L., 649
Vittum, M. T., 850
Vogt, E., 460
Voročihina, A., 666
Vysockij, A. A., 664

Wakeley, P. C., 746
Wakonig, T., 134
Waldo, G. F., 725
Walker, J. C., 831
Walker, M., 880
Wallace, R. H., 600
Wassenaar, L. M., 721
Watanabe, Y., 273
Watson, D. J., 364
Watson, P. J., 416
Watts, V. M., 231
Weber, A. V., 329
Weibel, D. E., 216
Weisæth, G., 625
Weiseth, *see* Weisæth
Well, S. A., 369
Wessling, W. H., 515–6
Wettstein, D. von, 115
Whitaker, J. R., 687
Whitehouse, R. N. H., 38, 291
Whyte, R. O., 400
Wiebe, R., 379
Wierszylowski, J. G., 636
Wilcoxson, R. D., 256
Wilkins, M. H. F., 121
Wilkinson, G. N., 14, 19
Williams, E. J., 18
Williams, W., 37
Wilsie, C. P., 189
Wilson, F. D., 426
Wilson, W. F., 230
Winstead, N. N., 820, 825
Wisniewski, A., 609
Wittmer, G., 563
Wolff, S., 136
Wollman, E. L., 48, 62, 70
Wood, C. A., 650
Woodhead, C. E., 659
Wright, J. W., 775

Yakir, I., *see* Yakir, Y.
Yakir, Y., 430
Yamaguchi, H., 355, 384–6
Yang, K.-C., 392
Yeh, P. S., 217
Young, P. A., 238
Yusuf, N. D., 536

Zakirov, K. Z., 506
Zalov, M. K., 293
Zamenhof, S., 88
Zamkovoj, G. T., 346
Zanotti, L., 456
Zelen, M., 12
Zerpa, D. M. de, 706
Zhinkin, L. N., 116
Žilkina, M. D., 269
Zimmermann, K., 903
Zink, F. W., 811
Ziver, A., 857
Žižila, M. I., 476
Zohary, D., 408, 442
Zubay, G., 123
Žukovskaja, A. A., 716
Žukovskij, P. M., 50, 162, 244
Žukov-Verežnikov, N. N., 118
Zürn, F., 404
Zwintzscher, M., 634

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